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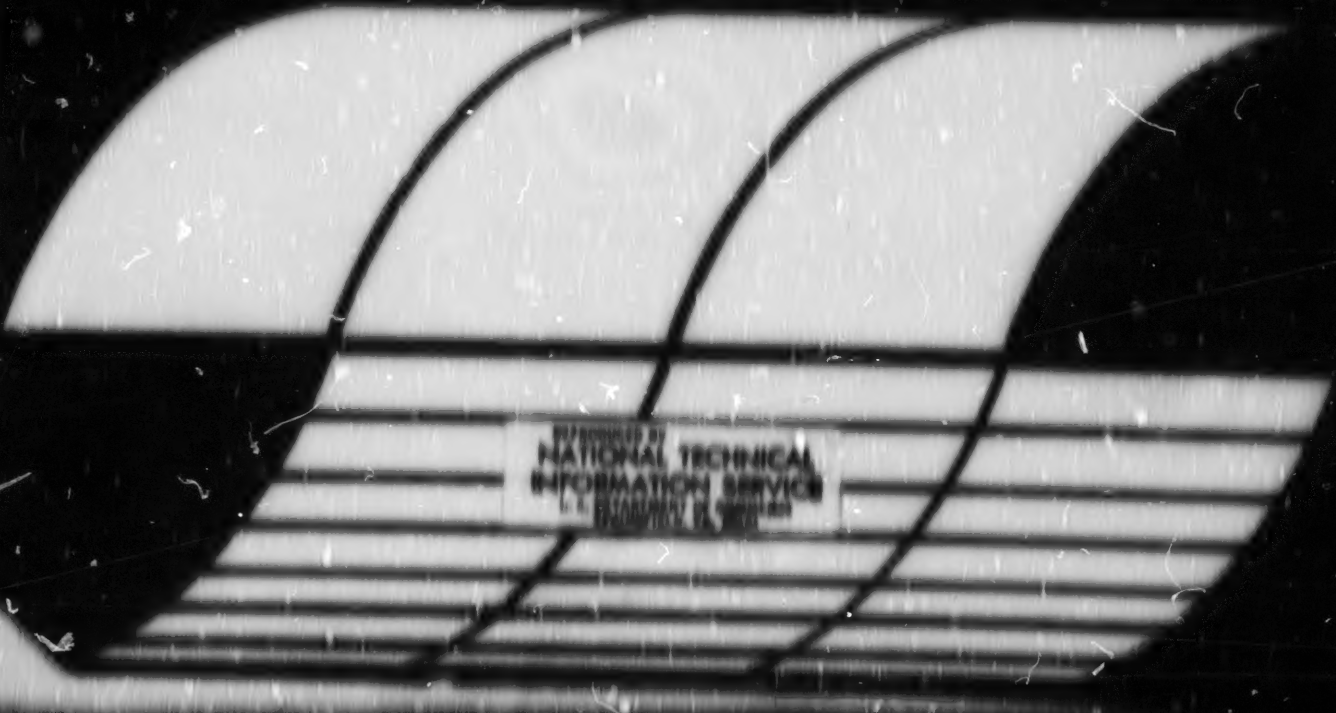

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Integrated quantitative gas chromatographic measurements of the nearly one hundred individual hydrocarbons present in ambient air were made to determine the total non-methane organic burden at a midwest rural site in coordination with halocarbon, oxidant and local meteorological variables in July and August 1975. Although the sample location was clearly rural, it was only 100 km north of St. Louis, Missouri. Consequently, four situations could be distinguished at this site: clean rural air, transport from near urban areas, transport from distant urban areas, and air-mass stagnation. In the latter situation, the rural air was well mixed on a regional scale with natural and anthropogenic ozone precursors. Fluorocarbon-11 and meteorological data were used to identify and describe the four situations and to interpret the observed concentrations of hydrocarbons and oxidant resulting from local photochemistry and transport.

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Integrated quantitative gas chromatographic measurements of the nearly one hundred individual hydrocarbons present in ambient air were made to determine the total non-methane organic burden at a midwest rural site in coordination with halocarbon, oxidant and local meteorological variables in July and August 1975. Although the sample location was clearly rural, it was only 100 km north of St. Louis, Missouri. Consequently, four situations could be distinguished at this site: clean rural air, transport from near urban areas, transport from distant urban areas, and air-mass stagnation. In the latter situation, the rural air was well mixed on a regional scale with natural and anthropogenic ozone precursors. Fluorocarbon-11 and meteorological data were used to identify and describe the four situations and to interpret the observed concentrations of hydrocarbons and oxidant resulting from local photochemistry and transport.

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SECTION 1

INTRODUCTION

In July and August of 1975, Washington State University (WSU) carried out an intensive measurement program to determine the species of hydrocarbons and their concentrations in a clearly rural location that was often influenced by emissions from the St. Louis urban area as well as other more distant pollutant sources. The intent was to discriminate natural from anthropogenic hydrocarbons and to apply this understanding to the involved chemistry that results in hydrocarbon oxidation products such as ozone and aerosols. This paper will concentrate on the general character of the hydrocarbons measured at the rural site and on the oxidant behavior in the air masses that passed over the study site. From the data at this one site, we extract four situations. These four serve as distinct examples of the interplay of meteorology and chemistry in the photolysis of urban and rural hydrocarbons, and the consequent production of elevated rural ozone levels.

The paper begins with a description of the Glasgow site near St. Louis, Missouri, and the instrumentation WSU used to measure ozone, halocarbon and hydrocarbon compounds, the latter species being present at concentrations of just a few micrograms per cubic meter for individual components. The data are summarized and incorporated into correlations that characterize the entire sampling period. The halocarbon data also are compared with acetylene data. Acetylene was used as a secondary tracer. The halocarbon and acetylene, coupled with available weather information, implicate several different cities as sources of the polluted air reaching Glasgow. This tracer and meteorological information suggests that meteorological transport and hydrocarbon photochemistry may interact in several distinct ways. For this reason, we present case studies to describe four situations, which are classified as follows:

1) Remote: unambiguously clean and therefore accepted as characteristic of air unaffected by any discernable urban contamination;
2) Near plumes: urban pollutant plumes with easily measurable levels of primary pollutants still reacting in transit over the rural study site;
3) Distant plumes: clearly marked fluorocarbon plumes, with most of the reactive hydrocarbons consumed;
4) Regionally polluted: no plumes noticeable, but clear evidence of photochemical oxidation of hydrocarbons and elevated oxidant.

Sampling Site

Washington State University operated its mobile unit at Glasgow, Illinois from July 17 through August 14, 1975. The actual site was located 1/2 km west of Glasgow (population 100) and 106 km from the Gateway Arch in St. Louis, at a bearing of 345° (NNW of the Arch). The site area was rural farmland primarily used for growing corn and soybeans (See map, Figure 1).

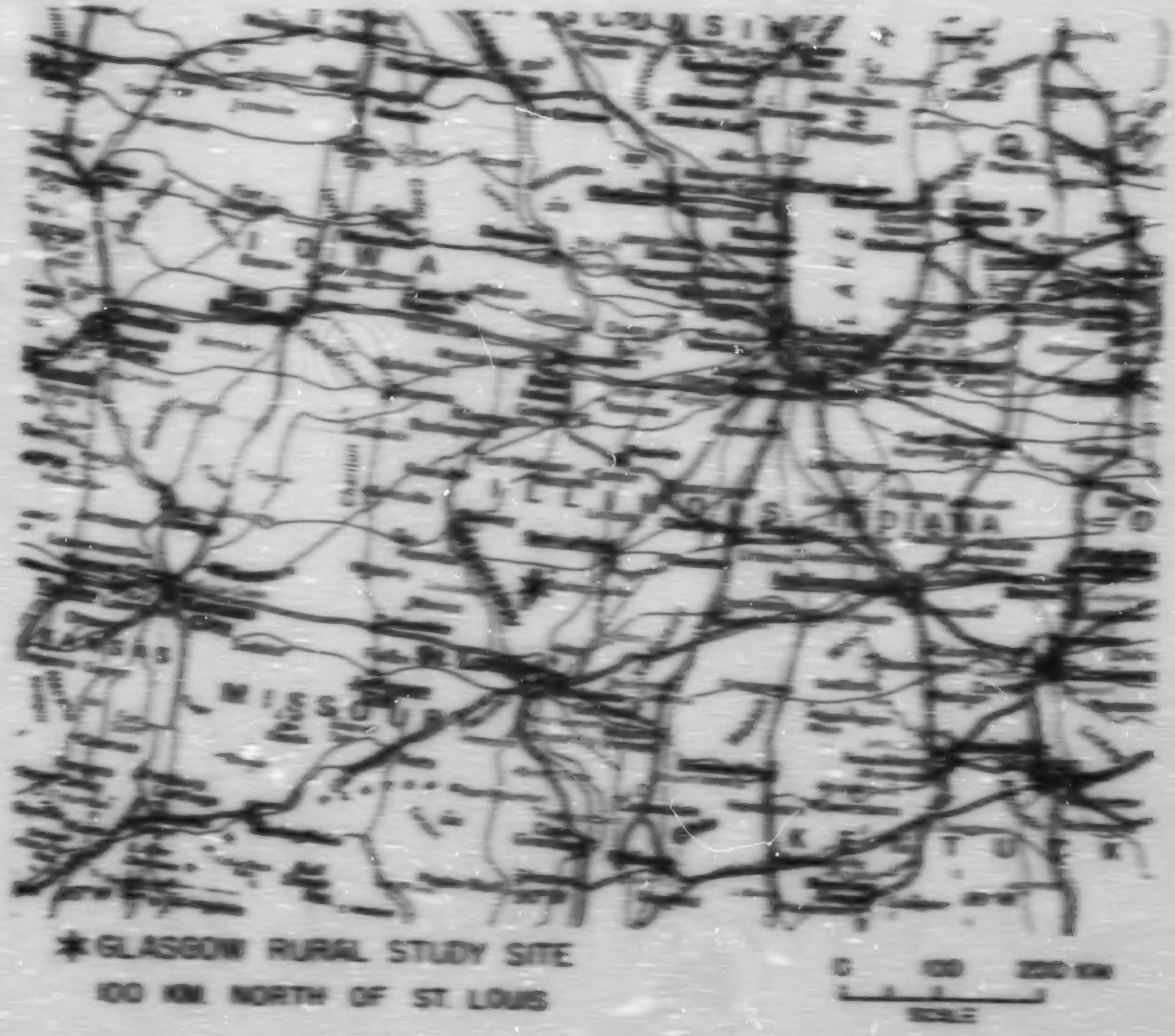

IOWA
ILLINOIS
INDIANA
MISSOURI
KENTUCK
★GLASGOW RURAL STUDY SITE
100 KM. NORTH OF ST. LOUIS
0 100 200 KM
SCALE

Figure 1. Map of the site area.

SECTION 2

METHODS

HYDROCARBON ANALYSIS

Hydrocarbon analyses were performed using three Perkin-Elmer flame ionization gas chromatographs. Instrument one (PE model 990) analyzed hydrocarbons from butane through decane (C_4 to C_{10}). The column used was a 200-ft SCOT OV-101, phase ratio α = 65, programmed from 0° to 100°C at 4°C/min. Helium flow rate measured about 7 ml/min. Instrument two (PE Model 3920) quantified hydrocarbons from ethane through hexane. A 20-ft by 1/16-in. outer diameter (o.d.) stainless steel column packed with Durapak (n-octane/Porasil C) was used. Separation was accomplished when programming from -70° to 65°C at 16°C/min with a flow rate of 7 ml/min of helium. The overlap in carbon number between the two instruments provided a check in determining actual concentrations of individual compounds. Total non-methane hydrocarbons then were determined by summing the C_2 through C_4 compounds on instrument two with the C_5 through C_{10} compounds on instrument one. Instrument three (PE Model 3920) analyzed specifically for ethane, ethylene and acetylene and provided another check on the precision between instruments. The column used was 5 ft by 1/8 in. o.d., filled with Porapak N, operated isothermally (55°C) with a carrier flow rate of 30 ml/min helium.

Calibration was accomplished using neohexane as an external standard. Response factors for all hydrocarbons were considered to be one. For example, 32 ng of neohexane has an area response of 1.00 on the PEP-1 computer. This ratio, 32 ng/area of 1.00, is then multiplied by the individual peak areas. The result for each peak is in nanograms per 1000 ml of sampled air, or the equivalent of micrograms per cubic meter of sampled air. Summing the individual hydrocarbons peaks gives a good indication of the total non-methane hydrocarbon burden.

Identification of the hydrocarbons was accomplished by periodically injecting a set of standard compounds and then matching their retention times with those from an actual sample. Those peaks with similar retention times were named accordingly. Occasionally an actual sample was "spiked" with a standard to further support identification.

The air samples (500 to 1000 ml) were obtained from the sampling manifold with 100-ml ground-glass syringes. The air was passed through an enrichment trap that was located in front of the head of the column. The liquid oxygen Dewar flask used to facilitate the freezeout was replaced with one of hot water (90°C) to assist the transfer of the contents of the traps onto the analytical column.

HALOCARBON ANALYSIS

Halocarbon analyses were performed employing a Perkin-Elmer 3920 electron capture (Ni 63) gas chromatograph. The column was fabricated with a 10-ft by 1/4-in. o.d. stainless steel tubing packed with 10% SF-96 on Chromosorb W (100-120 mesh). The column oven was operated isothermally at 45°C. Carrier flow (95% Ar-5% CH_4) was 30 ml/min.

Calibration was accomplished by preparing known concentrations in static chambers in the home laboratory. Dilution of the appropriate amount of pure halocarbon species into the chambers gave concentrations simulating ambient air levels to a precision of ± 10%. Reference canisters were then calibrated and shipped to the field site for daily calibration of the instruments.

The ambient air sample was drawn through the sample loop (5-ml volume) with a metal bellows pump (MB-41) hooked in line to the sampling manifold. Automatic analyses of Freon-12, Freon-11, methyl chloroform and carbon tetrachloride were conducted every 20 minutes. Halocarbon identification was accomplished by matching retention times with standards. Periodically, samples were obtained outside the field laboratory to check against possible contamination due to leakage in the gas sampling system.

OTHER ANALYSES

Continuous ozone measurements were also conducted to supplement the hydrocarbon and halocarbon detection. The instrument used was a Meloy Model OA 350-2. Zero and calibration checks were performed daily with a MacMillan

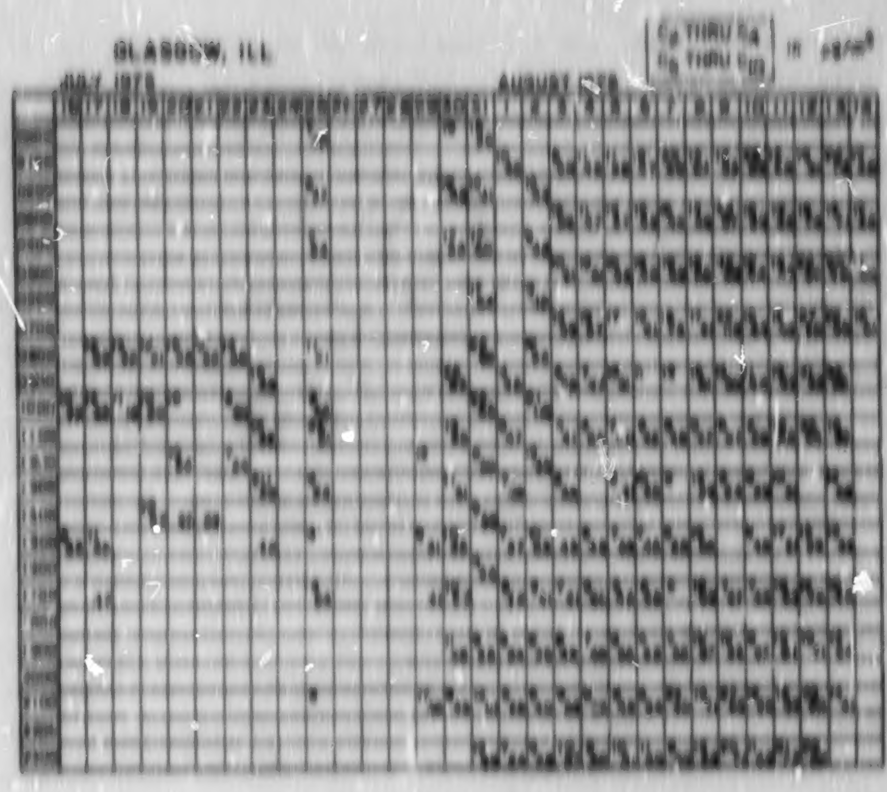
Model 1000 ozone generator, which was calibrated in the laboratory by the standard KI method prior to the field sampling period.

Various meteorological parameters were also recorded. These include wind speed and direction, solar radiation, temperature, and dew point.

FIELD DATA SUMMARY

A summary table (Table 1) was constructed showing all the ambient analyses of hydrocarbons during the entire study. In each square, the day, the time, the C_2-to-C_4 hydrocarbon concentration, and the C_5-to-C_{10} hydrocarbon concentration totals are presented. The difference in the number of analyses made in July versus August is due to a single 8-hour work shift operated in July and three 8-hour shifts operated in August.

TABLE 1. LIGHT AND HEAVY HYDROCARBONS SAMPLED AT GLASGOW, ILL; TIMES ARE CENTRAL DAYLIGHT TIME


GLASGOW, ILL
JULY [illegible]
AUGUST [illegible]
C_2 THRU C_4
C_5 THRU C_{10}
in μg/m³

SECTION 3

OVERVIEW AND AIR CHEMISTRY OBSERVATIONS

Before we investigate the air chemistry of specific days, let us look at the correlations that appeared to run through all the data. The halocarbon and total non-methane hydrocarbon data are shown in Figure 7. Our expectations were that the changes in the atmospheric concentration distribution of the halocarbons would reflect their origins mainly for the cities. Thus, they would be ideal tracers of the relative degree of urban contribution to the air's composition measured at the rural site at Glasgow. The data were easily interpreted by this view. Correspondingly, the minimum concentrations observed were interpreted to be indicative of clean background rural air. The data show that the lowest Fluorocarbon-11 ($CFCl_3$) concentrations were a minimum of about 115-120 ppt, a magnitude characteristic of the northern hemisphere background for this time period. Positive excursions from this baseline occurred almost daily, sometimes only 5 or 10 ppt, sometimes 100 ppt or more when the sampling site was obviously directly downwind of the urban area of St. Louis. A distinguishing feature of the F-11 profile was its spiky character, which seemed to indicate that pollutants were not being rapidly dispersed by vigorous vertical stirring or horizontal transport. The inability of the fluorocarbon levels to fall to the minimum background level after major excursions to elevated concentrations indicates that incomplete dispersion resulted in the buildup of a fluorocarbon residuum level characteristic of area-wide air-mass stagnation. The frequent occurrence of low levels of fluorocarbons approaching the geographical background level of 115 ppt of that time suggests that Glasgow and St. Louis were generally upwind of the major Midwest and Northeast urban source areas. Indeed, when the wind persisted out of the east for two days (August 7 and 8), the minimum levels of Fluorocarbon-11 were nearer 130 to 135 ppt. Under these latter conditions, we believe we were observing halocarbon levels representative of a regionally mixed residue of air of urban origin spread over the area.

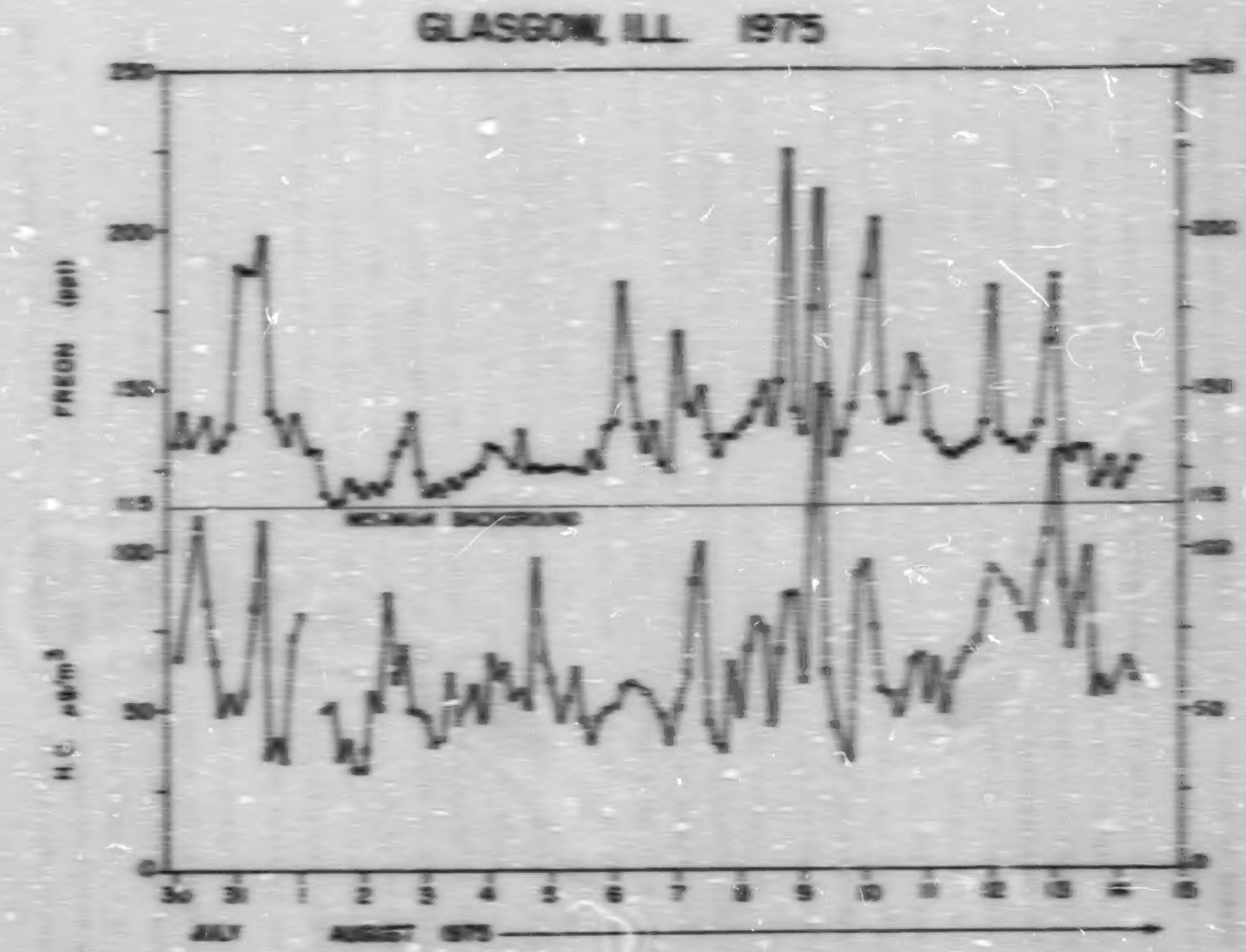


Figure 2. Hydrocarbon and Fluorocarbon-11 measurements made at Glasgow, IL. Note fluorocarbon peak concentrations indicative of urban plumes.

For hydrocarbons, the situation was more complex. Instead of measuring a few chemical species as for the halocarbons, the hydrocarbon analysis consisted of as many as 50 to 100 hydrocarbon species whose individual concentrations were very low, but gave integrated totals of 50 μg m^{-3} or more.

All of the non-methane hydrocarbon species are expected to be removed by atmospheric oxidation processes. Thus, even ignoring dilution due to diffusion or dispersion, the hydrocarbon loading of an air parcel will decrease downwind from the city of origin. Individual hydrocarbons will decrease at different rates, determined by their relative rates of reaction and the oxidizing properties of their environment. This latter phenomenon is controlled not only by the supply of sunlight, nitrogen oxides, ozone and hydroxyl radical, but also by the combined effect of the hydrocarbon for heterogeneous reactions with aerosols and the radicals formed in the atmospheric photolysis.

In general throughout the entire study period, the total hydrocarbon levels showed considerable variation under conditions that were not merely a reflection of urban contamination. That is, they did not always correlate well with the fluorocarbons. This suggests that rural sources may have had a considerable source strength effect on the atmospheric burden as well as a geographical or temporal variability. Lower values for total non-methane hydrocarbons (TNMHC) were around 30 μg m^{-3}, with typical concentrations more in the range of 40 to 50 μg m^{-3}. When the fluorocarbon trace showed clear urban influence, the TNMHC loading could rise to 150-175 μg m^{-3}. More difficult to appreciate is the fact that sometimes the TNMHC values would not rise at all in synchrony with conditions of significant increases in the fluorocarbon values. Overall, the coincidence between Fluorocarbon-11 and TNMHC spikes is good, although the relationship does not allow us to predict peak hydrocarbon levels from the peak fluorocarbon levels.

For certain individual hydrocarbons, the relationship is much clearer. Acetylene, for example, showed minimum concentrations of 0.2 to 0.5 μg m^{-3} when fluorocarbons were at baseline levels, and reached peak values of up to 3 μg m^{-3} simultaneously with the elevated fluorocarbon levels. Of course, as acetylene was measured only every two hours, the detail inherent in the fluorocarbon record of three analyses per hour could not be reproduced in the hydrocarbon data. Additionally, there was more scatter in the lower acetylene measurements because the sensitivity limits of the flame ionization detector were being pushed to make the lowest acetylene measurements.

The data for the other light hydrocarbons (C_3 and C_4) also correlated fairly well with the fluorocarbon data. The hydrocarbons from C_2 through C_4 were measured separately from the total hydrocarbon burden (TNMHC). This fraction of the hydrocarbon burden correlated better with the Fluorocarbon-11 data than did the TNMHC. Ethane, propane and i-butane, along with acetylene, seemed to contribute most to this correlation; propene and the butenes did not correlate well. These observations concur with the fact that the latter species display higher reactivity with oxidizing compounds or radicals and therefore would react earlier and be removed from the air mass before it reached the Glasgow site if hydrocarbons from distant sources were being intercepted. Alternately, if the more reactive species (i.e., olefins) measured at the rural site were of a local natural origin, they would not be expected to correlate with the fluorocarbons.

The remainder of this report will be concerned with two related questions:

1) the origin of contaminated air reaching the interurban sampling site at Glasgow, and
2) the nature of the hydrocarbon-oxidant chemistry that modulated the concentrations of the trace substances observed.

We will address these questions through a series of case studies of the different sampling situations that were observed at the Glasgow site. The limited weather information available makes the identification of sources of the compounds measured ambiguous on the basis of the meteorology alone. Some of the ambiguity is removed by using the halocarbon compounds to trace air trajectories back to cities. The objective of these case studies is to reconstruct the air movements and relate these to the oxidant chemistry. The approach does not provide absolute certainty; however, the fact that similar conclusions can be reached based on the oxidant profiles, weather information, and the hydrocarbon data separately encourage the approach.

Rarely does a single day at the site appear to be completely clean or constantly influenced by recent urban emissions. Thus the case studies must use information from various days to construct a coherent picture of the pollution episodes that occurred at the Glasgow site. The spiky character of the fluorocarbon records suggests that plume boundaries are well defined in the data. The following chemical regimes identified describe most of the situations intercepted at the rural site.

SECTION 4

A CLEAN RURAL SITUATION: AUGUST 1 AND 2, 1975

AIR MASS HISTORY

Geostrophic winds on the surface charts for August 1 and the preceding days indicate that the air moved in from the southeast, probably missing urban areas. This is supported by the fluorocarbon trace shown in Figure 3. The early hours of the day, from 0300 to 0800 CDT, showed $CFCl_3$ concentrations of 130 to 140 ppt, noticeably higher than 115 ppt, the northern hemispheric background at that time. However, from 0800 CDT on, fluorocarbon concentrations dropped to values below 120 ppt, which indicated that very clean air was moving over the station. Later in the day, showers in the unstable Gulf air affected the area, blocking sunlight to the area, washing out the atmosphere, and mixing in cleaner air from above. The very low fluorocarbon levels (<120 ppt) associated with this air did not persist for more than several hours. By the next morning (August 3) the fluorocarbon levels had again begun to increase from 125 to 140 ppt, and the clean episode had ended.

HYDROCARBON COMPOSITION

Total non-methane hydrocarbon was relatively low for August 1, especially in the afternoon during a period of shower activity. The TNMHC ranged from 30 to 50 $\mu g\ m^{-3}$. The low 30 $\mu g\ m^{-3}$ readings in the afternoon may well have been due to rainout experienced at or upwind of the site. A more typical range for hydrocarbon concentrations under clean conditions is from 30 to 70 $\mu g\ m^{-3}$. (These estimates are based on analyses of clean situations occurring on other days at the Glasgow site, and on data from Elkton, Missouri, obtained a few weeks later by the same instrumentation and field crew.) All of the hydrocarbon measurements made during the August 1 and early August 2 time frame seemed to be in the lower portions of their ranges in this weather situation. During this same period the light hydrocarbon (C_2 to C_4) concentrations ranged from 4 to 8 ug m^{-3}, while the higher hydrocarbons (C_5 to C_{12}) totaled 25 to 50 ug m^{-3}. All values decreased in the afternoon, possibly due to rainout, as already mentioned, or due to the influx of hydrocarbon-poor air from above the boundary layer to the surface. In addition, the diminution of the natural hydrocarbons source strength, with cooling temperatures and subsequent reactions in the oxidant chemistry of the area that would diminish the measurable hydrocarbon burden at the Glasgow site, is equally possible.

OXIDANT CHEMISTRY

As Figure 3 illustrates, ozone concentrations were also relatively low all day August 1, ranging from 13 ppb at 0700 CDT to 40 ppb by 1300 CDT. Shortly after noon, clouds cut out the radiation, and the ozone declined to 20 ppb by late afternoon and early evening. A minimum of 3 ppb occurred at 0800 CDT on August 2, while hydrocarbons were quite high at 78 ug m^{-3}. Ozone levels climbed rapidly to 24 ppb by noon, when F-11 was still only 129 ppt. After this, ozone continued to rise, but higher fluorocarbon levels indicated that the situation was no longer identifiable as "clean." By 1700 CDT, fluorocarbons spiked to 155 ppt; ozone showed a corresponding spike and then declined rapidly to a minimal value, only to increase briefly coincident with another fluorocarbon spike just before midnight.

How characteristic are these ozone concentrations of a remote rural situation? The data for August 1 and 2 suggest that the ozone studies under clean conditions may or may not be controlled by an oxidant photochemistry--that is, conditions which allow for both ozone creation as well as destruction. The clean situation of August 1 typifies the diurnal ozone profile. However, the less clean situation of August 2 suggests that the afternoon ozone may have declined because of a decline in vertical mixing related to the cooling trend instituted by the shower activity, rather than a reduced intensity of photochemically significant solar radiation. During midday and into the afternoon, vertical mixing normally brings down ozone from the free atmosphere above the boundary layer to ground level. This source can significantly replenish surface ozone. Since the wind on August 2 fell after 1500 CDT, possibly due to the lesser radiative heating of the surface, this source was shut off. The ozone present then further decayed by reactions

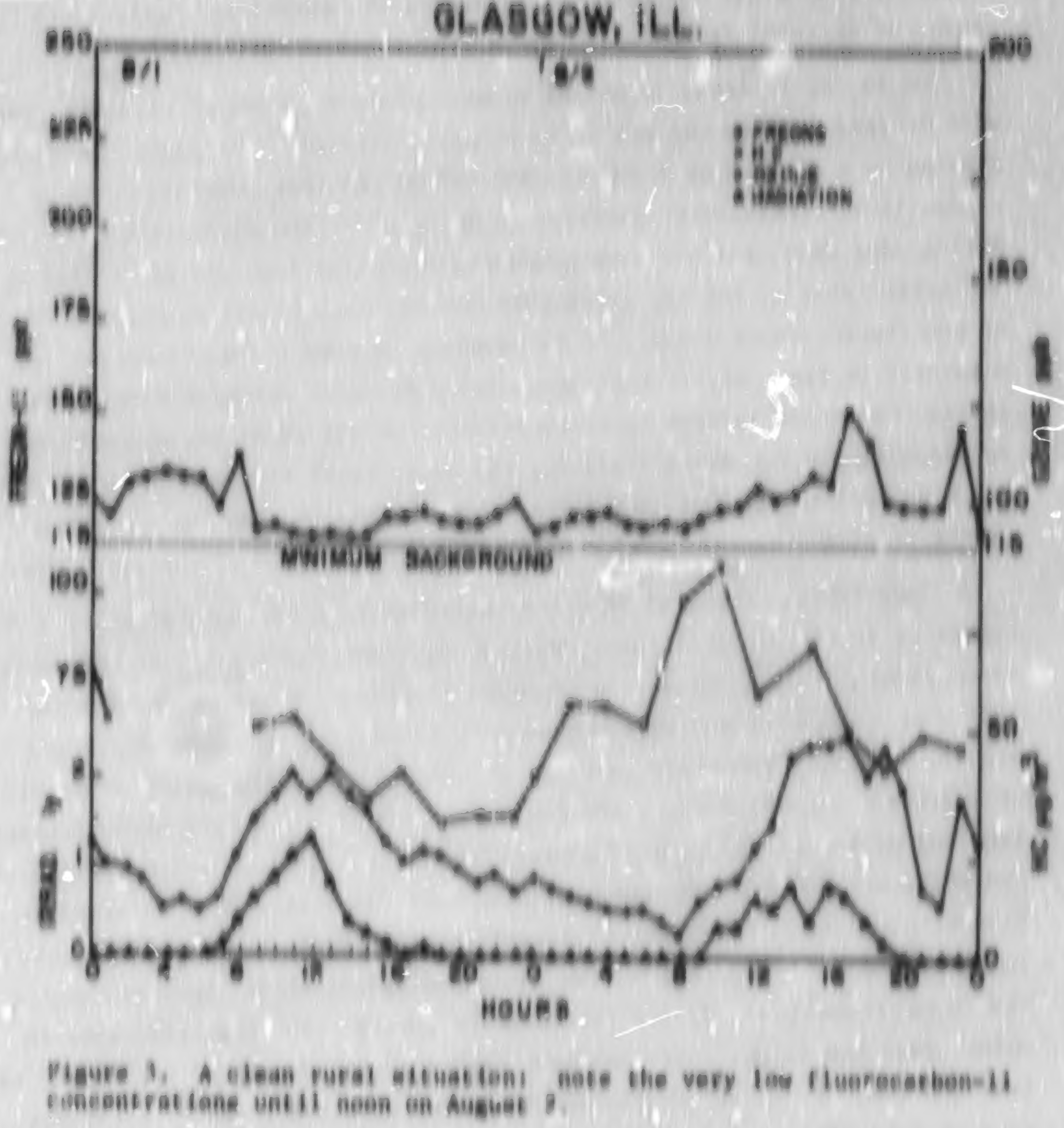


Figure 3. A clean rural situation: note the very low fluorocarbon-11 concentrations until noon on August 2.

with surfaces and airborne trace substances, including hydrocarbons.

The rapid decrease in the August 2 afternoon ozone profile is consistent with these conditions. The late evening rise with the sharp increase in F-11 suggests that a residual urban plume intercepted the study site. This interpretation is further supported by examining the events of August 1 that preceded the increase in the pollution burden observed on August 2.

On August 1, ozone decreased slowly to about 18 ppb at midnight, when the wind dropped further and the hydrocarbons increased. The ozone continued to decline to a minimum of 6 ppb at 0800 CDT on the next morning, while the hydrocarbon level continued to increase to 80 µg m^{-3}. The fluorocarbon levels during this same time had very gradually increased from 120 ppt to 125 ppt. Not until later in the day (1700 CDT) did any significant spiking to 150 ppt of the fluorocarbons occur. It is tempting to draw a connection; as the naturally emitted hydrocarbons accumulated in rural air within an increasingly shallow nocturnal surface layer inversion, the amount of ozone destroyed correspondingly increased, reducing the ozone level to a minimum until it could be replenished the next day by onset of the movement of increased levels of anthropogenic oxidant or oxidant precursors into the study area.

Other typical rural clean nighttime regimes do not show as sharp a decrease as do the August 1 data. Generally, the ozone level does not decrease below 25 or 30 ppb at night, as observed in Elkton, Missouri in 1974 and 1975. At observatories above the surface boundary layer, many nighttime situations show a temporary increase in the ozone. These latter observations of increased nighttime ozone are due to the cutoff of surface ozone scavengers from below; i.e., natural and man-made emissions. This is quite typical of the Whiteface Mountain Observatory in upstate New York. Data obtained at Elkton, Missouri (to be reported separately; Rasmussen et al., 1976) show the same order of variation in the ozone and hydrocarbons, however, with a much greater stability in the fluorocarbon levels. The nighttime rise in ozone under conditions that the fluorocarbon levels described as "clean" has been observed by WSU at several widely different field sites. At Glasgow, a rise of this kind was observed on July 19. The current explanation for these nighttime rises in ozone observed below the nighttime inversion layer are turbulent breakups of the overhead inversion layer. Such a break need not last long; if so, the replenishment needed to sustain the increased surface level of ozone is soon cut off. When the source is cut off, the ozone level is observed to decrease gradually to an early morning minimum through further ozone-scavenging reactions. During persistent windy and stormy periods, however, the surface ozone traces observed in rural areas may give no sign of diurnal variability. Under these conditions, vertical mixing is not controlled by surface heating, and there is not sufficient short-wavelength radiation to augment the background ozone burden through the natural photochemical production of ozone.

SECTION 5

THE URBAN PLUME OF ST. LOUIS: AUGUST 8 THROUGH 10

AIR MASS HISTORY

From August 5 to 10, a large high-pressure system had settled slowly over the Midwest from central Canada. The air pollution data for this period is shown in part in Figure 6. Winds turned slowly from the northeast to east to south as the high-pressure system continued to move to the southeast. Figure 7 shows the situation schematically following the migration pattern of the slowly moving high-pressure system during this period. The daily minimum fluorocarbon readings, which we may take as a relative index of the general pollution level of the regional air mass, rose slowly. The rise began on August 3, and was not significantly disturbed even by the passage of a very weak cold front. The increase of the daily minima was from about 120 ppt on August 5 to 130 ppt on the 9th, and 140 ppt on the 10th (Figure 6). This increase in the minimal background level was gradual. A look at the surface winds affecting the area leaves little doubt that the air samples intercepted on August 8, 9 and 10 originated from St. Louis.

The distinction between the pollutant plumes in Figure 6 is no doubt due to specific features of the synoptic weather situation. The high-pressure system just described was threatened on the 9th by an approaching cold front. The front weakened steadily and dissolved, and it is doubtful any fresh air mass was brought into the area. There was no decrease below the lowest observed level of 130 ppt of the fluorocarbons during this period. As the cold front approached, however, winds picked up and changed direction several times, and each time the urban plume of St. Louis blew over the field laboratory afresh.

The following are the details of the weather as taken from weekly weather summaries. As the wind swung to the south, the fluorocarbon spike signalled the presence of the plume observed at 1600 CDT on the 8th. An approaching

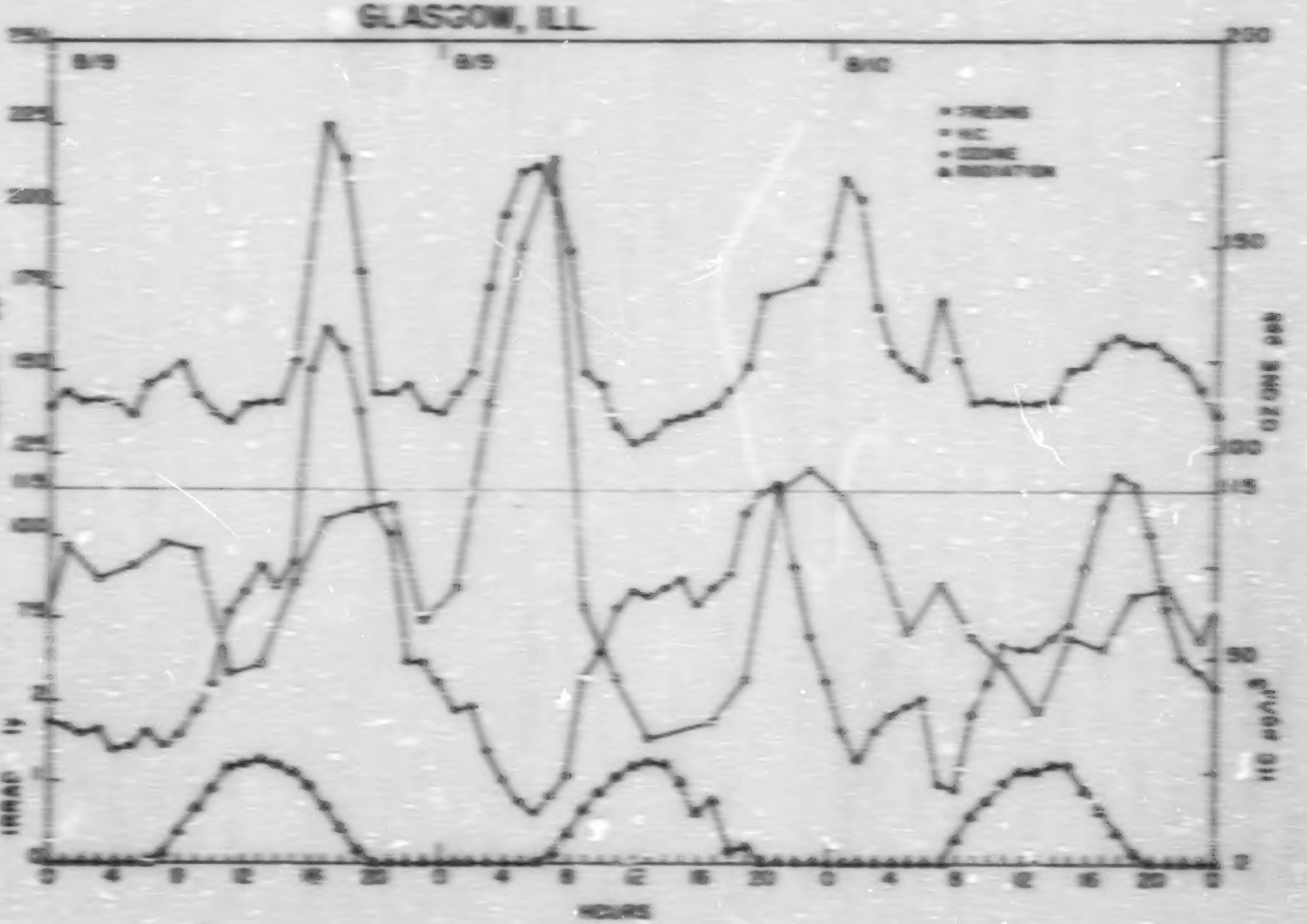


Figure 4. Urban plume of St. Louis as perceived by ambient air measurements at Glasgow. Note the differing behavior of ozone during night and day plume episodes.

squall line propagating ahead of the cold front of the 9th produced a meso-scale shift in the wind which allowed a second strong influx of city air seen to be intercepted at the Glasgow site at about 0600 CDT on the 9th. In this case, fog reported at synoptic stations indicated (for the area around the Glasgow site) that the transport had taken place beneath a fairly strong inversion. (Further support for this interpretation may be available in the acoustic sounder data obtained at the site for EPA.) A further wind shift brought the fluorocarbon concentrations down to about 130 ppt for several hours. As the high-pressure system slowly arched back into the area that evening, the winds shifted again to the south and slowed. By 0100 CDT on the 10th, the pollutant plume of St. Louis over the Glasgow site had become increasingly strong, as indicated by its multiple character of several plumes of different intensity. Once again fog developed at the weather stations in the area, indicating a strengthening nocturnal inversion.

HYDROCARBON COMPOSITION

The similarity of the hydrocarbon (TNMHC) and halocarbon traces in Figure 6 helps to confirm an urban origin of the oxidant observed at the rural site for the three days of August 8, 9 and 10. Notice the fluorocarbon spikes occurred at the same time as spikes in the TNMHC. There does not seem to be a one-to-one correspondence, for the relative heights of the TNMHC peaks of 70, 150 and 80 $\mu g\ m^{-3}$ varied considerably, while fluorocarbon peaks were of almost equal magnitude, 201, 215, to 225 ppt. There are enough expected differences in the diurnal emission patterns of the hydrocarbons and halocarbons released in the St. Louis area that the correlation should not be one to one. Differing diurnal and spatial variations in the source strengths of the gases exist; however, another explanation also is suggested by the data. If we assume that the ratio of halocarbon and hydrocarbon started out from St. Louis in about equivalent amounts, then the reaction of the hydrocarbon during the transit time might be reflected in the data. This second explanation is also supported by some of the hydrocarbon information itself, namely the acetylene concentrations. Peak acetylene concentrations at Glasgow on August 8, 9 and 10 were almost equal—just as were the peak fluorocarbon levels. We assume that no significant photolysis occurred to acetylene in transit from St. Louis. Also, from sampling evidence, the proportion of acetylene in urban emissions was roughly constant. If we assume that auto exhaust emissions were the prime hydrocarbon source, the acetylene tracer quantity would support the contention that original hydrocarbon burdens of the plume air were equivalent. The radiation conditions that affected the plume in transit to the Glasgow site complete the story. The two hydrocarbon plumes with the lower TNMHC burden, 70 and 80 $\mu g\ m^{-3}$, were sampled in Glasgow in the late afternoons and evenings of August 8 and 10. However, the plume with the maximum hydrocarbon burden was intercepted in the very early morning hours (0100 to 0700 CDT) on August 9. Obviously the nighttime transit of the August 9 plume would preserve its hydrocarbon burden from any appreciable photochemistry. Therefore, we believe that the equivalent fluorocarbon and acetylene concentrations observed for all three plumes and the greatly divergent hydrocarbon burden observed only for the nighttime plume strongly support the approximate 50% loss in the hydrocarbon through subsequent atmospheric reactions in the two plumes intercepted after a day's irradiation. The above proof is not rigorous but does have a consistency with the observed facts.

In summary, due to varying chemical and physical conditions, the three plume samples detected on these three days had lost differing amounts of hydrocarbon en route to Glasgow. Under these conditions the dominant variation is no doubt the amount of solar radiation necessary for photolysis and the time for reaction that the plume constituents experience en route.

OXIDANT CHEMISTRY

A more subtle, more suggestive feature of the concentrations observed during the study at Glasgow is that if we add the magnitudes in the units given for the hydrocarbon ($\mu g\ m^{-3}$) and ozone (ppb v/v), the sum has a trace almost identical in shape to the fluorocarbon trace. This can be construed to mean that 1 $\mu g\ m^{-3}$ of carbon oxidized produces 1 ppb of ozone. In other words, about 1.6N carbon atoms in various hydrocarbon compounds oxidize in a process that gives N molecules of ozone. This formula is, of course, not very rigorous. We believe it works in this case because essentially the same hydrocarbon-NO_x mixture is sampled after approximately a constant time lag from the point of emission. Since NO_2 is an oxidized species that photodissociates extensively to produce ozone in daylight, it should be added into the model. We did not measure NO_2 because the expected low concentrations at the Glasgow site are extremely difficult to measure accurately and routinely under field conditions.

Ozone during the plume intercept situations acted very much like man-made ozone observed within a city. When the St. Louis urban plume passed over Glasgow on the afternoon of the 9th, the early morning St. Louis city emissions had, by mid-afternoon, reacted (and diluted) to produce a 130-ppb ozone concentration over the Glasgow farmland. The St. Louis ozone plume then wandered and was not measured at the site for several hours. But early in the morning of the 9th (0600 CDT) the ozone level in the plume over the site had dropped to 12 ppb. The evening of the 10th shows a similar process of maxima and minima ozone levels associated with the day versus nighttime interceptions of the St. Louis plume. Presumably, Glasgow on the 10th was not yet under the plume centerline, as identified by the fluorocarbons, but ozone concentrations had reached 95 ppb by 2000 CDT. We believe this illustrates that in the plume downwind of a city, the surface concentrations of the pollutants are consistent with the major diurnal features acknowledged for urban smog-type chemistry. That is, at night the hydrocarbons and other oxidant scavengers build up, and ozone diminishes rapidly as the photochemical mechanisms are extinguished. Counter to this is the persistence of the ozone levels observed in city plumes above the nighttime surface inversion.

SECTION 6

THE URBAN PLUME OF A MORE DISTANT CITY: AUGUST 6, 1975

AIR MASS HISTORY

As the high-pressure system previously considered settled into the Midwest between August 8 and 10, with the multiple interception of the St. Louis plume, so did the Glasgow site also experience an earlier set of air pollution episodes of a more general nature. On August 5 and 6, the urban plume from a more distant city than St. Louis was intercepted. This is shown by the very large increase in the Fluorocarbon-11 level to 207 ppt observed at 0200 CDT (Figure 5). In this case, the wind had been persistently blowing toward St. Louis. Geostrophic winds on the southeast side of the high-pressure center--Figure 6 shows that the high was then centered over the upper peninsula of Michigan--had been blowing from the northeast, and the surface winds naturally had a more northerly component. The origin of this air mass with its high fluorocarbon level cannot be absolutely proved; however, we suspect that it came from Chicago, 370 km to the northeast. Trajectories based on surface winds certainly allow this origin. Surface winds are more appropriate for transport within a nocturnal inversion. The geostrophic winds consistently implicate both near and distant cities. In addition, the intensity of the elevated fluorocarbon episode suggests that the source's strength was relatively large or relatively near. However, the hydrocarbon and oxidant information suggest that the city was not near.

HYDROCARBON COMPOSITION

Hydrocarbon concentrations in aggregate showed hardly any change during the intercept of the urban plume on August 6. THHC data showed variations similar to the variations observed for many relatively clean days. Specifically, it increased from about 40 to about 66 μg m^{-3} and then fell again to 50 μg m^{-3} during the course of the highly elevated fluorocarbon episode.

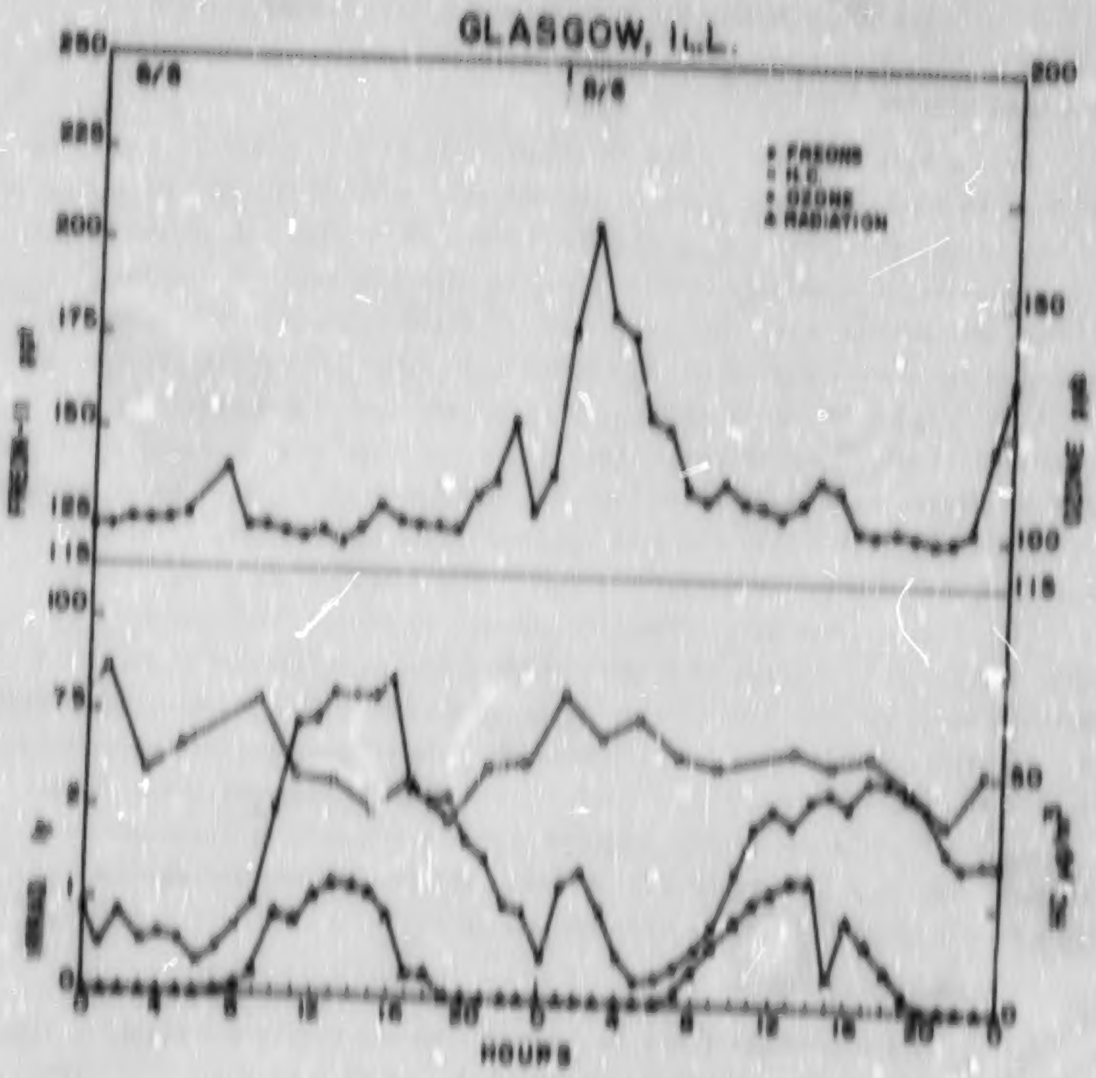


Figure 5. Urban plume of a more distant city. Note the sharp oxidant increase at 2 CDT as the plume, signaled by a fluorocarbon-11 spike, passes over the field laboratory.

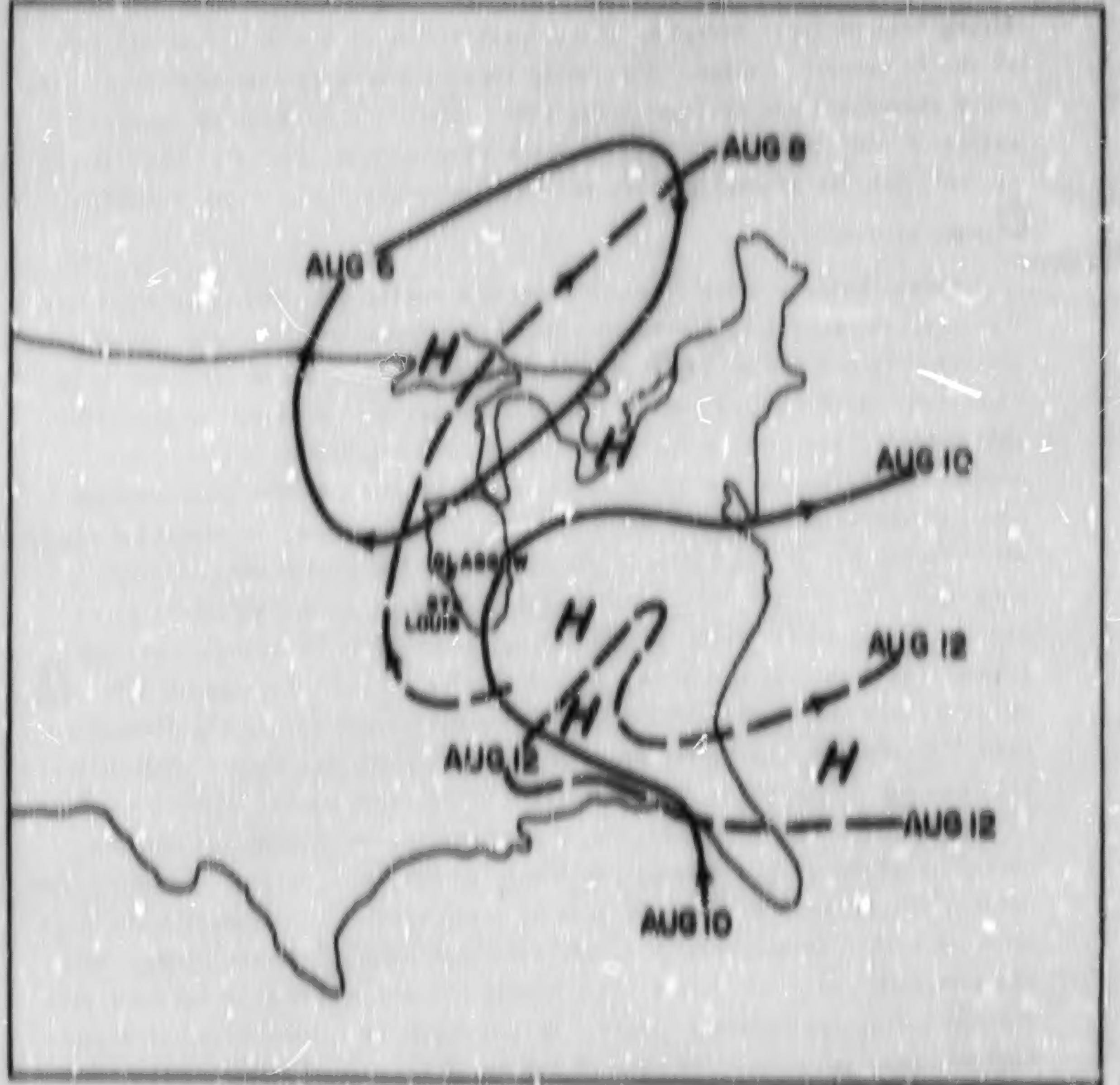

AUG 8
AUG 6
H
H
AUG 10
GLASGOW
ST
LOUIS
H
AUG 12
H
AUG 12
H
AUG 12
AUG 10

Figure 6. Passage of a high pressure system across the Midwest from August 6 through 12, 1975. The 1012 mb isobar and center of the high (H) are plotted to give a general impression of the circulation for that period. Winds generally blow parallel to the isobars in the directions shown.

Previous day concentrations as high as 69 μg m^{-3} had occurred on August 5, when the fluorocarbon levels were at very low levels (around 125 ppt). On the other hand, light hydrocarbons, with the exception of propene, increased during this period. Acetylene showed peak values of 1.6 μg m^{-3} at the time of the fluorocarbon spike. This would suggest a more distant transport. Isoprene showed a clear decline during this period. It reached its lowest values an hour or so after maximum urban fluorocarbon exposure. This is consistent with its diurnal pattern for minimum values early in the morning.

OXIDANT HISTORY

Ozone showed a clearly related increase during this nighttime urban-air exposure, identified by the rapid rise in the fluorocarbon levels. Ozone increased from 9 ppb to 28 ppb in parallel with fluorocarbon increase, with coincident rapid rise in the fluorocarbon levels in the middle of the night. This behavior contradicts the oxidant behavior observed in the St. Louis plume. In the latter situation, urban plumes sampled in the early morning hours showed anomalously low ozone concentrations compared to nighttime clean-air situations. In other words, the close-in urban plumes show an ozone pattern similar to the city ozone pattern. Counter to the St. Louis plume situation, the interception of the Chicago plume shows an increase of ozone through the nighttime hours with a gradual rise in the hydrocarbons. The anomalies are explainable in terms of transport from a relatively distant city. Presumably, the hydrocarbon emissions from Chicago have already undergone one day of photochemical oxidation. The photochemically reactive hydrocarbons have already been oxidized; e.g., propene, which explains why the chromatogram showed essentially paraffinic materials. Isoprene entrained from natural sources in the rural air mass has been similarly consumed by the presence of high concentrations of ozone and other oxidants in the plume. Unreactive compounds, e.g., acetylene, remain and are observed to increase with the increasing fluorocarbon levels. By the second day, photochemical production of ozone has slowed for lack of further injection of high levels of reactive hydrocarbons and/or other requisite species such as NO_x. Similarly in the evening, ozone consumption has decreased, and the nocturnal values remain relatively high. Toward the sides of the plume where greater penetration of outside air has occurred, reaction with natural or local anthropogenic hydrocarbons may have reduced the ozone.

This model is quite consistent with our 1974 observations at Whiteface Mountain in northern New York state, where high nighttime ozone concentrations, up to 63 ppb, were observed moving through the Adirondak sampling site in the early morning, in the company of distinct increases in the fluorocarbon level.

SECTION 7

REGIONAL AIR CHEMISTRY DURING A STAGNATION SITUATION: AUGUST 12, 1975

Up to this point, we have considered the rural situation as it experienced the influence of an urban plume, or was remote from such influence. Monitoring the Fluorocarbon-11 as a tracer of urban activity has allowed this discrimination to be well defined. Previous oxidant chemistry studies have had to identify these patterns of the interception of "dirty" or "clean" air masses with less precise data. However, the occurrence of dirty vs. clean air-mass conditions is not limited to the distinct interception of local or distant urban plumes. Rather, during periods of stagnation--characteristic of certain periods in the life of a slowly migratory anticyclone--there may be widespread buildup of oxidant precursors within the boundary layer of the lower atmosphere that extends over both the urban and rural area. Nitrogen oxides and hydrocarbons from natural, industrial and urban sources may accumulate sufficiently to elevate the ozone levels through smog-type photochemistry that would cover large areas. In addition, some discrete ozone concentrations will be found in the path of the plume that continues to emanate from cities. The influence of anthropogenic oxidant precursor emissions in rural areas by its nature must be complex.

In this section, we present data for a situation of this type which is best described by the mix of emissions from various sources, and which exhibits its own local photochemistry that is reflected in area-wide oxidant levels that are not solely of natural origin.

AIR MASS HISTORY

In the overview section of this paper, we described a rise in the fluorocarbon baseline from 115 ppt on August 1 to 130 ppt by the 12th of August 1975. This gradual rise in the baseline was suggested by the lowest F-11 value for each day in Figure 2. In general the lower concentration of these observed fluorocarbon levels did not vary much except for periods of one to several hours duration when the fluorocarbon level significantly spiked. These dramatic increases were interpreted as the interception of urban plumes. Under conditions of shifting winds, the minimum levels used to construct the fluorocarbon baseline are characteristic of the extent of the influence of dispersal of urban emissions in the air mass moving over the sampling station. The extent of this influence is the air within one or two days journey of the station. The increased levels of the halocarbon measurements do not represent an increase of F-11 in global background level. Neither was the analyser experiencing a drift in sensitivity--for the reproducibility of the Fluorocarbon-11 analyses was 2-3 ppt. The conclusion is that increase in F-11 minimal levels above the global background baseline and the related increases by all other species in the Illinois-Missouri region was due to regional accumulation of anthropogenic and natural emissions during the study period.

The meteorological description of the situation also concurs with these interpretations of the air-chemistry data. The last distinct influx of clean air was on August 2, with the advance of the leading edge of a high-pressure system cutting into the area from the north, introduced by an active, rainy cold front. This same anticyclone drifted southeastward, as shown previously in Figure 6. The air trajectories for the pressure system circulated through or from the eastern United States during this period. The high-pressure system was slow to leave the area, and a new, threatening cold front to the north affected winds in the area with south winds as described in the discussion of August 8 and 9. These later days were associated with the St. Louis plume situations. However, throughout this period from August 1 to 12, the air mass as a whole had not been washed by rain or diluted by surface winds from cleaner regions. According to geostrophic wind calculations, even air parcels arriving at the site from the south on the 10th had probably been over Indiana or Ohio a day or so previously. Significant haze and limited visibility situations were noted on the evening weather charts for the 10th and 11th. Similarly, on the 12th, the day of interest here, winds from the southwest brought in air which had apparently been over the more populated states east of Glasgow a day or so before. The increased speed and the southwesterly direction of the winds on the 12th was due to the approach of a new cold front over Iowa, 300 miles to the northwest.

We may examine the August 12 situation from a viewpoint previously described for Ohio in the summer of 1974. In the context of the slowly migratory high-pressure system model of Westberg and Rasmussen (1975), the Glasgow sampling site was now on the northwestern side of the high-pressure system. The center of the front was over Alabama and retreating southeastward. It was to pass out to sea in two days, by the 14th. Figure 7 places Glasgow in terms of this model. According to Westberg's model, this position of the site relative to the center of the high-pressure system favors long-distance transport of oxidant plumes and the general admixture of dispersed urban sources such as to account for the area-wide accumulation of elevated air pollution episodes.

The plumes detected by the F-11 analyses of the 12th were, however, relatively minor. Slow, variable winds carried to the site two distinct episodes of fluorocarbon-enriched air, at the beginning and end of the day (see Figure 8). These air parcels probably had a recent urban origin, because for those times the wind blew to the south from the St. Louis area. Between the episodes of elevated fluorocarbon, the wind was from the west-southwest for much of the day. The significantly higher baseline F-11 concentrations (143 ppt) observed between the episodes compared to the baseline levels (115 ppt) observed in early August suggest that the source of the increased pollution residuum is a regional airmass-air chemistry phenomenon.

HYDROCARBON COMPOSITION

Throughout this interval, from 0200 CDT to 1800 CDT on the 12th, total hydrocarbon content (TNMHC) levels remained relatively high at 74 to 92 μg m^{-3}. Acetylene was only slightly elevated above the characteristically clean rural levels, averaging about 0.3 to 0.5 μg m^{-3} rather than 0.2 μg m^{-3}. Olefins like ethylene and propene were at rural levels (0.6 and 0.3 μg m^{-3}, respectively), but many light alkanes, especially ethane, were high. Many of the higher-molecular-weight hydrocarbons were also at higher levels, including isoprene, which contributed from 4 to as much as 18 μg m^{-3} (5 to 20%) to the total hydrocarbon loading during the day of the 12th.

OXIDANT CHEMISTRY

Ozone remained above the National Ambient Air Quality Standard, 80 ppb,

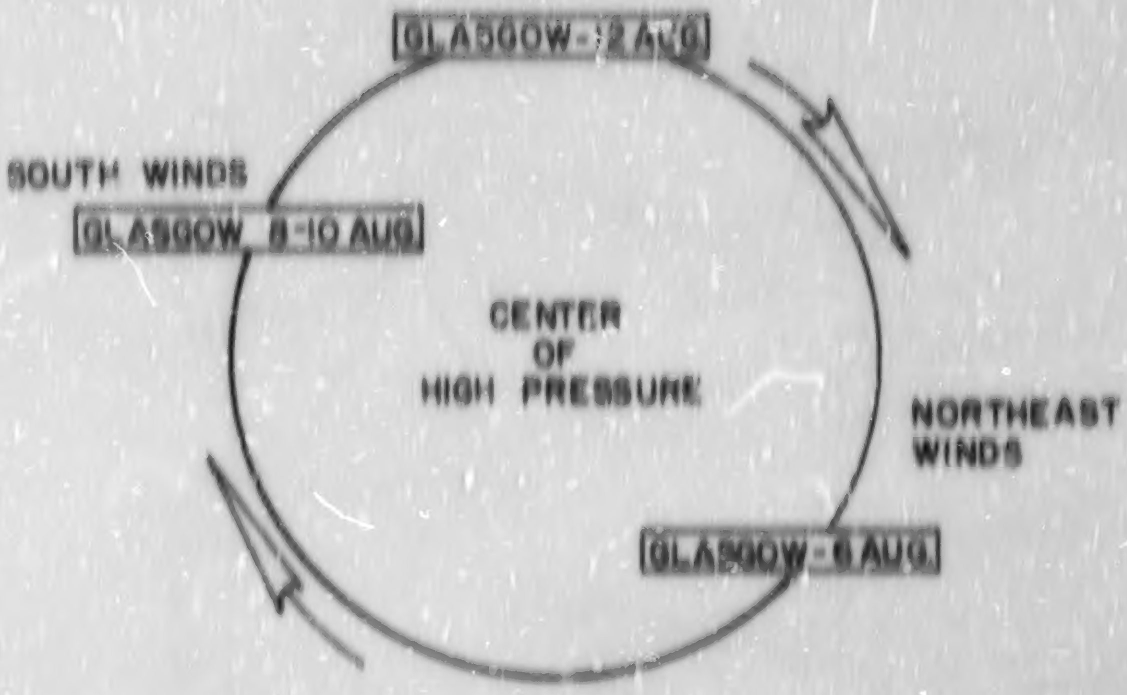

GLASGOW - 12 AUG
SOUTH WINDS
GLASGOW 8-10 AUG
CENTER
OF
HIGH PRESSURE
NORTHEAST
WINDS
GLASGOW - 6 AUG

Figure 7. Model of different transport regimes prevailing in different sectors of a slowly migratory anticyclone. Position of Glasgow, IL relative to the moving center of high pressure is shown for various situations described in the paper.

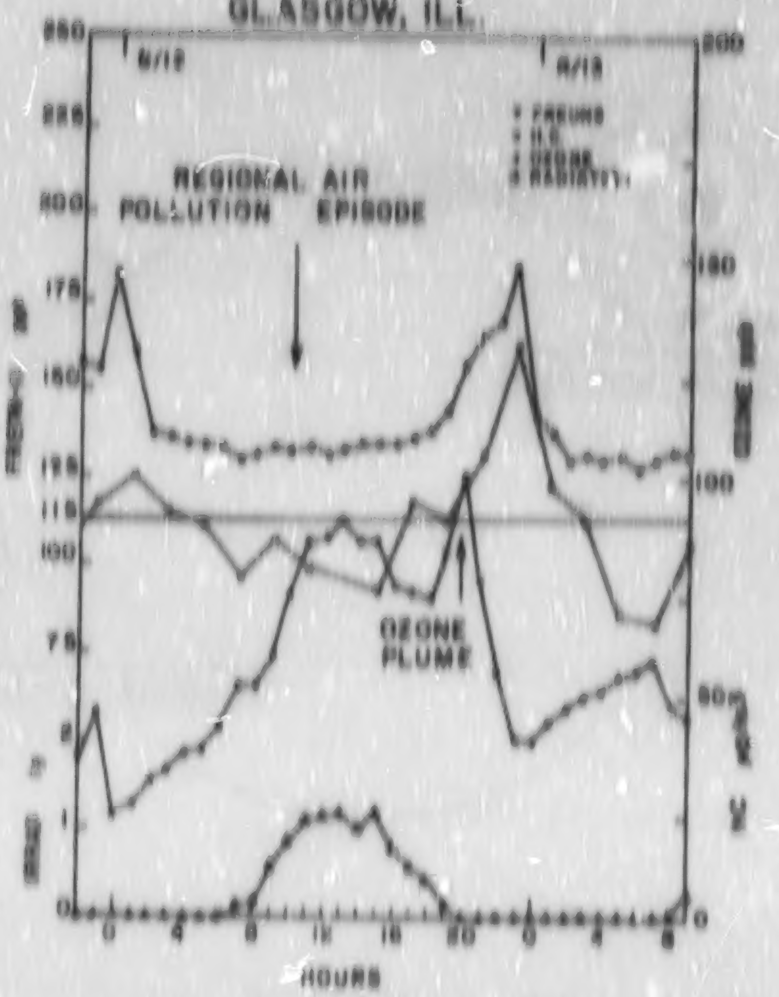


Figure 8. High oxidant observations during a period of apparent regional buildup of fluorocarbons and oxidant precursors.

for five hours during the middle of the day, when there was no direct evidence of the St. Louis plume in the area (see Figure 8). The midday maximum was 90 ppb. Later in the day, a south wind apparently brought in the plume, judging from the F-11 concentrations. Under this condition, the ozone increased to more than 100 ppb at 2300 CDT.

The midday oxidant maximum was accompanied by a minor decrease in the hydrocarbon levels, and coincided with the maximum solar radiation.

The clearest consistent picture to emerge from the air chemistry of this day is that ozone was produced in a rural area that had natural and diluted urban hydrocarbons that were spatially well mixed. The urban hydrocarbons with greatest reactivity, such as ethylene, propene and other olefins, had already been consumed by photochemical oxidation as they travelled their first day or so from the source area. Nevertheless, considerable photochemical oxidant is produced from these emissions, either during their first day of irradiation or subsequent days of irradiation through continued reactions of the more slowly reacting urban hydrocarbons or from naturally emitted hydrocarbons such as isoprene, which were abundant in the rural air.

SECTION 8

CONCLUSIONS

For some time, there have been arguments over the source of oxidant levels measured in rural areas, particularly those approaching or exceeding the federally mandated ambient air quality standard of 80 ppb. The more pertinent questions concerning its origin are:

1) Is the oxidant produced in cities and transported into the rural areas?
2) Is it manufactured en route to a rural site from urban precursors?
3) Is there region-wide production of elevated ozone over rural and urban areas alike?

The evidence suggests that, in the region around St. Louis, each mode of chemistry has its validity under different meteorological circumstances. We have seen sharply defined urban plumes, containing high oxidant levels of recent urban origin, as well as other plumes in which the oxidant level has decreased (along with diurnal variation of that oxidant) in traveling distances of several hundred kilometers. Also, situations of moderately elevated oxidant were observed at times when fluorocarbon and hydrocarbon tracers identified air of recent urban origin, but no urban plumes. All of these situations can be expected given the complexity of the meteorological mixing processes.

Other conclusions also stand out. Hydrocarbons, individually and collectively, are relatively variable in concentration within the period of one day. Natural sources appear to be as important as anthropogenic sources in rural areas. There is evidence for different degrees of reactivity of the various hydrocarbons that compose urban plumes, resulting in variable levels of associated ozone.

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Westberg, H.A. and R.A. Rasmussen. 1975. Measurement of Light Hydrocarbons in the Field and Studies of Transport of Ozone beyond an Urban Area. Monthly Technical Report on Contract Number 68-02-1232. U.S. Environmental Protection Agency. To be published as an EPA Report.

Appendix A

Hydrocarbon Data Tables for Sampling at Glasgow, Illinois

The following tables summarize the gas chromatographic measurements made at Glasgow, Illinois. Seventeen individual compounds, those generally present in the highest concentrations, are listed next to the time the sample was analyzed. The integrated concentration of the remaining peaks is reported as #19, "others." In addition, three other sums are reported: #8, the Light Hydrocarbons, a sub-total of the C_2 - C_4 hydrocarbons; #20, the Heavy Hydrocarbons, a sub-total of the C_5 - C_{12} hydrocarbons; and the grand total, labeled #21, Non-Methane Total Hydrocarbons. Blanks or "N/A" in the columns indicate that no data is available; dashes (--) indicate that quantities were below the 0.2 micrograms per cubic meter detection limit. See Section 2 of the body of the report for more information on the two gas chromatographs used and their standardization and properties.

DATE 7-16-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	N.M.C. ②	N.M.T.H.C. ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800																					
0900																					
1000	4.6	NA	0.5	1.7	0.5	0.6	2.1	10	2.0	3.9										62	72
1100																					
1200	2.1	1.5	0.8	1.4	0.3	0.7	2.0	9	2.4	3.1											
1300																					
1400																					
1500	2.0	0.7	0.9	1.4	0.2	0.7	2.0	8	1.8	2.7										63	71
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 8 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 7-/7-'75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	H.C. ②	N.M.T.H.C. ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800	2.8	1.8	1.1	3.6	1.4	2.3	5.2	18	4.4	4.6										67	87
0900																					
1000	1.7	1.8	0.9	3.6	0.8	1.1	2.9	13	3.9	4.2										95	108
1100																					
1200																					
1300																					
1400																					
1500	3.7	1.6	0.5	2.4	0.4	0.8	1.7	11	2.3	5.0										56	67
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 7-18-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPYLENE	I-BUTANE	N-BUTANE	Σ1 THRU 7	I-PENTANE	BENZENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	M/P-XYLENE	O-XYLENE	UNKNOWN #3	OTHERS ①	ΣHC ②	TOTAL HC ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800	4.7	NA	0.6	4.1	0.5	0.9	2.2	13	3.9	4.6	1.3	0.6	0.7	0.5	0.3	0.5	–	0.6	19	32	45
0900																					
1000	3.3	1.0	0.6	3.2	0.3	0.6	1.9	11	3.3	5.3	1.0	0.4	0.7	0.5	0.4	0.4	–	0.4	4	16	27
1100																					
1200																					
1300																					
1400																					
1500																					
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COLS THRU COL. 19 ③ Σ COL 8 AND COL. 20

DATE 7-19-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ 1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	N.H.C. ②	N.M.T.H.C. ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800	4.1	1.9	0.4	3.6	-	0.3	2.0	12	1.1	4.2	1.4	0.6	1.2	0.4	0.4	0.4	-	0.6	11	21	33
0900																					
1000	2.6	0.7	0.4	3.3	0.2	1.0	2.6	10	1.3	3.3	1.6	0.9	1.6	0.6	0.3	0.3	-	0.6	10	20	30
1100																					
1200																					
1300																					
1400	3.2	0.4	0.3	3.2	0.3	0.9	2.1	10	1.6	4.9										27	37
1500																					
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 7-20-75

µg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPYLENE	I-BUTANE	N-BUTANE	[illegible]	I-PENTANE	N-PENTANE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m-XYLENE	o-XYLENE	UNKNOWN #3	OTHERS ①	NMHC ②	TOTAL HC ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800	4.5	1.1	0.3	4.0	0.3	0.3	2.1	19.1	1.3	3.0	1.2	0.5	1.2	0.3	-	-	-	0.9	17	25	44
0900																					
1000	4.6	0.7	0.3	4.5	0.2	1.2	3.2	14.7	1.2	1.4											
1100																					
1200	4.3	1.1	0.4	3.5	0.2	0.3	2.4	12.6	1.7	1.1	1.4	0.9	1.0	0.4	0.4	0.4		0.5	26	34	47
1300																					
1400																					
1500																					
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 7-21 75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	TOLUENE	UNKNOWN #1	[illegible]	UNKNOWN #2	[illegible]	[illegible]	[illegible]	UNKNOWN #3	[illegible] ①	[illegible] ②	[illegible] ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800	2.0	1.3	0.2	2.5	0.2	0.4	1.9	9.6	1.6	2.1	1.2	0.8	0.4	0.2	3.4	0.4	-	4.9	15	22	31
0900																					
1000																					
1100																					
1200																					
1300																					
1400																					
1500																					
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 7-22-75

$\mu g/m^3$

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ 1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	H.H.C. ②	N.M.T.H.C. ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800	4.1	2.2	0.6	4.0	0.4	0.6	2.1	14.0	1.3	3.6	3.0	0.5	0.7	0.4	0.4	1.0	-	0.7	26	38	52
0900																					
1000	2.6	0.7	0.6	1.6	0.2	0.5	1.8	7.9	0.7	2.4	1.3	0.8	0.9	0.5	0.3	0.4	-	0.6	22	30	38
1100																					
1200	1.9	0.9	0.5	1.1	0.3	0.4	1.7	6.8	0.7	0.9	0.7	0.4	0.6	0.4	0.2	0.3	-	0.8	19	24	31
1300																					
1400																					
1500																					
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 7-23-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	n-BUTANE	Σ1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m,p-XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	NMHC ②	TOTAL HC ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800																					
0900	4.2	1.5	0.7	5.5	0.5	1.4	4.3	18.4	2.1	4.0	2.0	0.9	1.0	1.9	0.5	1.4	"	1.0	32	48	66
1000																					
1100	4.3	0.8	0.7	4.4	0.3	1.0	2.7	14.2	1.1	3.4	2.3	1.7	1.4	0.4	0.4	0.5	-	1.0	20	32	46
1200																					
1300	5.1	1.1	1.4	5.5	0.3	1.6	4.6	19.6	1.8	5.1	2.6	1.6	1.5	0.9	0.5	0.6	0.3	0.8	20	[illegible]	54
1400																					
1500																					
1600											2.0	1.5	1.9	1.7	0.5	0.9	0.2	0.9		40	
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL 9 THRU COL 19 ③ Σ COL 8 AND COL 20

DATE 7-24-75

µg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α PINENE	UNKNOWN #3	OTHERS①	NMHC②	NMTHC③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800																					
0900																					
1000																					
1100																					
1200																					
1300																					
1400																					
1500																					
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400	1.5	0.7	0.6	1.4	0.4	0.5	1.3	6.5	0.9	0.5	2.9	0.5	0.6	4.0	0.3	0.6	0.2	7.6	16	29	36

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 7-25-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	N-BUTANE	[illegible]	[illegible]	[illegible]	TOLUENE	UNKNOWN #1	[illegible]	UNKNOWN #2	ETHYLBENZENE	[illegible]	[illegible]	UNKNOWN #3	OTHERS ①	[illegible] ②	[illegible] ③
0100																					
0200	1.5	1.1	0.4	1.7	0.3	0.3	1.1	6.4	0.6	0.9	1.5	0.5	0.6	1.6	0.3	0.5	0.2	1.3	19	27	33
0300																					
0400	1.7	1.0	0.4	2.1	0.4	0.5	1.2	7.3	0.7	0.3	1.4	0.7	0.6	0.4	0.3	0.5	0.2	1.1	17	24	31
0500																					
0600																					
0700																					
0800	1.6	2.2	0.4	2.0	0.2	0.8	3.6	10.8	2.1	2.2	1.7	0.3	0.5	0.4	0.5	0.9	0.3	0.6	11	21	32
0900																					
1000	1.8	NA	0.5	2.2	0.2	0.6	2.2	7.5	1.1	1.9	2.8	[illegible]	0.6	0.4	0.3	0.7	0.2	1.0	15	24	32
1100																					
1200	1.3	0.3	0.2	0.7	2.0	6.0	4.5	56	14.4	0.9	NA	1.0	1.5	1.0	0.3	0.5	0.2	0.9		21	77
1300	1.4	0.6	0.3	0.6	0.2	0.3	0.7	4.3	0.3	0.4	NA	1.2	1.3	1.3	0.3	0.4	0.2	0.9	17	24	28
1400																					
1500	1.4	0.5	0.2	0.7	-	0.1	1.1	4.0	0.8	0.7											
1600																					
1700	1.4	0.4	0.3	0.7	NA	NA	NA	~4	0.4	1.1	NA	0.9	1.2	0.6	0.2	0.3	0.1	1.0	18	24	
1800																					
1900																					
2000																					
2100	2.4	1.2	0.7	1.8	0.7	0.6	1.5	8.9	1.0	10.2	1.6	1.4	1.2	0.3	0.6	1.5	0.6	1.2	26	46	55
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL 9 THRU COL 19 ③ Σ COL 8 AND COL 20

DATE 7-29-75 $\mu g/m^3$

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	NMHC ②	NMTHC ③
0100																					
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800																					
0930																					
1000																					
1100																					
1200	9.0	1.1	0.6	3.2	0.3	1.2	3.0	18.4	1.1	3.9											
1300																					
1400																					
1500	2.6	0.5	0.5	2.5	0.6	0.8	5.1	9.2	0.9	4.9	2.8	1.5	1.4	0.4	0.7	0.3	0.2	0.7	17	31	40
1600																					
1700											2.7	1.2	1.7	1.0	0.8	0.6	0.5	0.8		41	
1800																					
1900																					
2000																					
2100	4.4	0.9	0.7	5.5	0.2	1.2	3.7	16.6	1.4	1.1	4.6	2.4	2.4	4.0	2.6	2.7	-	1.6	29	52	69
2200																					
2300																					
2400	5.4	1.5	0.7	5.6	0.5	1.3	3.9	18.9	1.5	0.7											

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 7-30-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	UNKNOWN #1	[illegible]	UNKNOWN #2	[illegible]	[illegible]	[illegible]	UNKNOWN #3	OTHERS ①	[illegible] ②	TOTAL ③
0100																					
0200	4.4	1.2	0.9	5.5	0.4	1.5	4.1	18.0	1.6	0.6	NA	1.5	1.4	1.2	0.9	.9	0.3	1.7	37	43	66
0300																					
0400	4.0	1.2	0.7	5.1	0.4	1.3	3.9	16.6	1.5	0.5	NA	1.4	0.9	1.9	2.3	2.8	0.4	1.7	46	59	76
0500																					
0600																					
0700																					
0800																					
0900	5.8	1.5	1.1	7.6	0.2	2.0	6.6	24.8	2.2	4.4	NA	3.9	6.0	2.4	1.1	2.1	1.1	5.9	60	85	110
1000																					
1100	4.8	0.9	1.0	5.9	0.2	1.6	4.7	19.1	1.6	4.8	NA	2.4	2.1	3.5	1.4	2.1	0.8	4.1	40	65	84
1200																					
1300	2.1	0.6	0.6	7.0	0.2	0.9	2.2	10.6	0.9	2.7	NA	1.4	0.9	1.7	2.4	0.6	3.2	2.2	40	51	62
1400																					
1500	2.1	0.6	0.6	2.7	-	0.9	1.9	9.0	0.7	4.2	NA	1.2	0.7	1.5	0.4	0.8	6.4	2.4	42	[illegible]	[illegible]
1600																					
1700	2.2	0.5	0.6	3.3	0.3	0.9	2.0	10.2	0.9	4.3	NA	1.6	1.9	1.4	1.9	3.4	1.0	3.1	40	53	67
1800																					
1900	3.4	0.9	0.5	2.9	-	0.9	1.9	10.9	0.9	6.8	NA	1.0	0.7	1.2	0.4	1.2	0.2	1.4	25	38	44
2000																					
2100	2.6	0.5	0.5	2.1	0.3	0.7	1.4	9.1	0.9	0.9	NA	1.9	1.2	1.2	0.3	2.3	0.3	0.7	34	46	54
2200																					
2300																					
2400	4.7	1.0	1.0	3.4	0.3	1.5	2.7	14.6	1.0	0.3	NA	2.3	1.5	2.3	0.6	0.6	0.3	1.5	24	35	

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 7-31-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	[illegible]	i-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	BENZENE	UNKNOWN #2	ETHYLBENZENE	m-XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	Σ HC ②	Σ TOTAL ③
0100																					
0200	4.6	1.3	1.0	3.5	0.6	1.3	3.1	15.4	1.1	0.4	NA	2.3	1.9	1.7	2.0	2.1	0.3	1.2	28	41	56
0300																					
0400	5.0	1.1	1.1	4.6	0.5	1.2	3.1	16.6	1.1	0.4	NA	1.9	1.7	1.3	1.8	1.4	0.6	1.7	29	40	57
0500																					
0600	5.5	1.4	1.1	4.6	0.4	1.2	3.2	17.4	1.2	0.6	NA	2.0	1.7	1.5	0.6	2.8	0.6	1.0	52	64	81
0700																					
0800	5.2	1.5	1.1	7.0	0.3	1.3	3.1	22.0	2.1	3.5	NA	2.0	1.7	0.5	0.8	1.7	1.5	1.2	71	86	108
0900																					
1000	5.9	1.1	0.9	2.9	0.6	3.0	6.2	20.6	4.9	3.4	NA	2.9	2.5	1.4	0.6	0.9	-	0.5	49	52	72
1100																					
1200	1.6	0.6	0.3	1.5	0.2	0.7	1.2	5.7	0.6	2.1	NA	2.0	1.2	0.6	0.4	0.6	-	0.4	22	30	36
1300																					
1400	1.9	0.6	0.7	2.3	0.5	0.9	1.3	7.7	0.8	1.5	NA	1.6	1.6	1.0	0.4	0.4	0.4	0.4	20	28	36
1500																					
1600	1.0	0.4	0.1	1.2	0.1	0.3	0.9	4.0	0.4	0.3	NA	1.2	0.9	0.6	0.4	0.4	-	0.4	27	31	35
1700																					
1800																					
1900	2.4	1.7	0.3	2.7	0.1	0.5	1.9	9.4	0.7	3.7	NA	0.9	0.5	1.2	0.3	0.4	0.3	1.6	16	25	34
2000																					
2100	2.6	1.7	0.4	2.5	0.7	1.3	2.7	11.9	1.4	1.8	NA	1.4	1.5	1.7	1.7	3.6	1.5	2.5	44	61	73
2200																					
2300	3.2	1.1	0.3	2.5	0.3	0.8	2.4	9.6	1.0	0.6	NA	1.7	1.9	1.0	2.2	4.5	1.5	2.9	52	69	79
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL 9 THRU COL. 19 ③ Σ COL 8 AND COL. 20

DATE 8-1-75 µg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPYLENE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	TOLUENE	UNKNOWN #1	[illegible]	UNKNOWN #2	[illegible]	[illegible]	[illegible]	UNKNOWN #3	OTHERS①	[illegible]②	[illegible]③
0100	3.1	1.5	0.3	2.1	0.3	0.6	1.4	10.4	0.9	0.5	NA	1.1	0.9	1.0	1.6	2.8	0.4	1.3	32	42	52
0200																					
0300																					
0400																					
0500																					
0600																					
0700																					
0800																					
0900	1.1	0.5	0.2	1.3	0.2	0.2	0.9	4.4	0.4	NA	NA	1.6	2.0	1.4	1.2	2.0	0.2	1.3	36	46	50
1000																					
1100	1.2	0.5	0.2	1.2	0.1	0.3	1.1	4.6	0.5	2.1	NA	1.8	1.2	NA	2.6	4.9	-	2.4	32	47	52
1200																					
1300	1.6	0.5	0.2	2.2	0.2	0.8	1.9	7.4	0.9	1.7	NA	1.0	0.8	NA	0.7	3.3	0.1	2.1	27	36	43
1400																					
1500	1.4	0.7	0.2	1.5	0.2	0.6	1.9	6.5	0.9	1.1	NA	0.9	0.7	1.2	0.4	0.7	0.4	1.8	19	27	34
1600																					
1700	2.0	0.7	0.3	2.2	-	0.7	1.8	7.7	0.9	1.6	NA	1.9	1.0	1.7	0.4	0.5	-	0.4	24	32	40
1800																					
1900	1.2	0.9	0.3	0.9	0.3	0.6	0.4	4.6	0.5	0.5	NA	1.5	0.4	0.9	0.7	0.4	0.2	0.4	18	24	29
2000																					
2100	1.3	0.7	0.3	1.0	-	0.5	1.0	4.8	0.6	0.5	NA	1.2	0.5	0.5	0.3	0.4	0.3	0.4	21	26	31
2200																					
2300	1.6	1.2	0.4	1.7	0.5	0.3	1.3	6.6	0.7	0.5	NA	1.1	0.6	0.7	0.4	0.4	-	0.5	19	24	31
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 8-2-76 $\mu g/m^3$

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPYLENE	I-BUTANE	N-BUTANE	[illegible]	[illegible]	[illegible]	TOLUENE	UNKNOWN #1	[illegible]	UNKNOWN #2	[illegible]	[illegible]	[illegible]	UNKNOWN #3	OTHERS ①	[illegible] ②	[illegible] ③
0100																					
0200	2.4	1.6	0.4	2.5	0.7	1.3	2.8	11.7	1.3	0.7	NA	1.2	1.4	1.4	1.2	2.4	0.4	2.2	31	43	55
0300																					
0400	1.9	1.4	0.4	2.2	0.4	0.5	2.0	8.8	1.0	0.5	NA	1.2	0.9	1.1	1.6	3.0	1.4	1.7	34	46	55
0500																					
0600	2.1	1.3	0.3	2.6	0.7	0.5	1.8	9.3	1.0	0.4	NA	1.4	1.0	1.8	1.4	2.7	1.2	1.5	29	41	51
0700																					
0800	3.4	2.1	0.4	5.2	0.7	2.2	4.9	18.9	2.1	1.3	NA	1.9	1.5	1.7	2.3	4.4	1.1	2.1	41	59	78
0900																					
1000	3.5	1.4	0.5	5.4	1.0	2.7	6.4	20.9	2.6	1.9	NA	1.3	1.1	NA	2.4	4.1	0.4	2.4	44	65	86
1100																					
1200	2.3	3.0	0.5	2.4	0.8	1.3	2.6	12.9	1.2	0.9	NA	1.6	0.9	1.9	1.2	1.8	1.2	2.6	32	45	58
1300																					
1400																					
1500	2.0	2.9	0.5	1.8	0.2	0.6	1.6	9.6	0.7	0.9	NA	1.8	1.1	3.4	2.1	3.5	1.0	5.6	41	59	[illegible]
1600																					
1700	1.7	2.3	0.4	1.4	0.2	0.4	1.5	7.9	0.6	1.1	NA	2.4	1.7	1.9	0.8	0.8	-	1.2	31	41	50
1800																					
1900	1.6	1.0	0.5	1.7	0.5	0.8	1.5	7.6	0.7	2.6	NA	1.0	0.4	2.0	0.5	0.4	-	0.9	26	35	43
2000																					
2100	1.8	1.7	0.8	1.7	0.6	0.7	1.9	9.2	0.9	4.9	NA	1.6	1.0	1.7	0.2	0.3	1.0	4.2	24	40	49
2200																					
2300	1.4	4.5	0.5	1.2	0.3	0.2	0.9	9.0	0.4	0.7	NA	2.0	1.0	2.2	1.3	1.4	-	2.9	27	38	47
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 5-3-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ 1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α- PINENE	UNKNOWN #3	OTHERS ①	NMHC ②	N.M.T.H.C ③
0100	1.6	3.4	0.3	1.7	0.2	0.3	0.9	8.4	0.6	-	NA	1.6	1.2	2.1	0.6	0.7	-	4.2	20	31	39
0200																					
0300	1.9	4.9	0.4	2.2	0.4	0.5	1.5	11.8	0.6	0.4	NA	1.1	0.8	1.9	0.4	0.6	0.8	2.1	17	26	38
0400																					
0500	2.2	2.3	0.5	2.5	0.6	0.4	1.7	10.2	0.9	0.6	NA	0.8	0.6	1.4	0.8	1.2	0.7	2.3	22	31	41
0600																					
0700	2.3	4.9	0.5	2.1	0.5	0.4	1.4	12.1	0.9	0.9	NA	1.4	0.9	2.0	1.6	0.8	-	2.5	28	39	51
0800																					
0900	1.6	0.9	0.3	1.3	0.2	0.6	1.2	6.1	0.7	1.1	NA	0.8	0.5	NA	2.7	4.1	0.3	2.9	42	55	61
1000																					
1100	1.5	0.6	0.3	0.9	0.2	0.2	0.8	4.5	0.6	1.2	NA	1.8	NA	NA	0.3	3.9	-	2.7	30	41	46
1200																					
1300	1.6	1.0	0.3	1.1	0.3	0.6	1.0	5.9	0.6	1.0	NA	0.9	0.7	2.4	1.0	1.4	0.3	3.1	24	36	42
1400																					
1500											NA	1.1	0.6	NA	2.2	3.4	-	2.2			
1600																					
1700	2.0	0.9	0.4	1.3	0.2	0.6	1.5	6.9	0.6	1.6	NA	1.9	1.6	2.3	1.1	0.9	-	2.0	29	41	48
1800																					
1900	2.1	0.7	0.4	1.5	0.4	0.7	2.6	8.4	1.0	-	NA	1.3	1.0	2.2	1.4	1.9	0.2	3.1	37	49	57
2000																					
2100	2.2	1.1	0.7	1.9	0.5	0.7	1.4	8.5	0.9	-	NA	1.0	0.6	2.0	0.2	0.4	-	1.9	31	38	47
2200																					
2300	2.2	1.6	0.3	2.3	0.6	0.5	1.9	9.9	1.1	4.4	NA	1.1	0.7	1.5	1.1	2.0	0.6	2.2	42	57	67
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 6-4-78

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	N-BUTANE	I-PENTANE	N-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	M-XYLENE	O-XYLENE	UNKNOWN #3	OTHERS ①	TOTAL ②	TOTAL ③
0100	2.7	1.7	0.7	2.8	0.5	0.7	1.9	10.9	1.1	2.7	NA	0.7	0.8	1.7	1.5	2.2	1.2	2.8	28	42	54
0200																					
0300	2.9	1.9	0.6	2.6	0.6	0.7	1.7	11.0	1.1	1.6	NA	1.5	1.0	13.8	2.2	2.2	1.3	2.9	18	47	57
0400																					
0500	3.0	1.9	0.5	3.5	0.6	0.7	1.7	11.9	1.0	1.3	NA	0.7	0.7	9.2	2.2	3.3	1.4	3.5	29	51	63
0600																					
0700	2.3	4.9	0.6	4.3	0.6	0.7	1.9	16.3	1.2	1.6	NA	0.7	0.6	2.0	0.4	1.0	0.7	3.1	26	57	83
0800																					
0900	1.7	0.9	0.4	2.0	0.3	0.7	1.1	7.0	0.9	2.7	NA	1.1	NA	NA	47	4.3	0.4	3.6	31	47	54
1000																					
1100	1.5	0.5	0.3	0.9	0.2	0.5	0.6	4.4	0.5	0.6	NA	1.5	1.1	4.5	1.2	1.1	–	2.9	39	52	56
1200																					
1300																					
1400																					
1500	1.6	1.0	0.3	0.4	0.5	0.5	0.9	5.6	0.4	0.7	NA	1.2	0.6	2.8	0.9	0.5	–	4.0	34	45	[illegible]
1600																					
1700	1.7	0.6	0.3	0.9	0.3	0.3	0.6	4.6	0.2	1.6	NA	0.7	1.3	6.7	2.9	5.9	0.3	2.1	70	92	97
1800																					
1900	1.6	1.9	0.4	0.9	0.1	0.5	1.0	6.5	0.5	10.9	NA	1.2	0.9	6.4	–	0.6	–	2.2	26	49	56
2000																					
2100	1.9	1.2	0.7	1.6	0.9	0.6	1.6	8.3	0.7	14.6	NA	1.0	0.6	6.6	0.6	0.8	0.4	2.1	31	58	62
2200																					
2300	1.9	1.2	0.6	1.8	0.6	0.3	1.3	7.7	1.0	12.2	NA	1.4	0.7	34	0.4	0.6	0.3	2.1	27	50	58
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COLS THRU COL. 19 ③ Σ COLS AND COL. 20

DATE 8-5-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPYLENE	I-BUTANE	N-BUTANE	Σ1-BUTENE	I-PENTANE	N-PENTANE	TOLUENE	UNKNOWN #1	DECANE	UNKNOWN #2	ETHYLBENZENE	M/P-XYLENE	O-XYLENE	UNKNOWN #3	OTHERS ①	ΣC5+ ②	ΣTOTAL ③
0100	2.3	2.0	0.6	2.1	1.4	1.0	1.3	10.7	1.7	8.1	NA	1.3	0.7	1.9	0.9	4.1	1.2	4.8	37	58	69
0200																					
0300	2.3	2.2	0.6	2.5	0.6	0.7	1.4	10.3	1.7	4.1	NA	1.3	1.0	2.0	1.1	2.0	0.9	2.5	20	37	47
0400																					
0500	2.6	2.1	0.4	2.8	0.4	0.3	1.3	161	1.5	3.1	NA	0.9	0.6	NA	0.3	0.7	0.4	2.5	33	43	59
0600																					
0700	4.4	4.8	0.8	4.0	0.9	0.4	1.6	16.9	1.8	2.4	NA										
0800																					
0900	3.0	1.2	0.7	2.6	0.5	0.6	2.5	11.9	2.0	2.4	NA	1.9	1.2	NA	1.5	2.5	0.2	2.6	36	51	63
1000																					
1100	1.6	2.1	0.5	1.0	0.6	0.7	0.7	7.2	1.3	1.5	NA	1.1	0.7	3.4	0.8	0.8	–	3.5	27	40	47
1200																					
1300	1.6	0.4	0.3	0.9	0.7	0.4	0.8	4.7	0.7	1.6	NA	1.2	0.8	2.7	0.8	1.3	–	2.4	29	41	46
1400																					
1500	1.4	1.2	0.3	0.8	0.3	0.8	1.8	6.6	2.4	1.6	NA	1.2	0.7	2.1	1.0	1.1	–	2.9	20	38	45
1600																					
1700	1.6	0.7	0.3	1.0	0.3	0.7	0.8	5.4	1.2	1.3	NA	0.9	0.4	2.6	0.4	0.6	–	3.3	31	42	47
1800																					
1900	1.9	0.9	0.5	1.7	0.5	0.3	0.9	6.2	1.2	1.9	NA	1.0	0.4	6.1	–	–	–	2.2	19	32	38
2000																					
2100	2.2	1.6	0.6	1.7	0.5	0.4	1.4	8.4	1.5	1.6	NA	1.9	1.5	2.1	0.7	1.1	0.5	2.8	29	42	50
2200																					
2300	2.3	1.5	0.8	1.9	0.7	0.7	1.6	9.8	1.6	1.2	NA	1.7	1.1	NA	0.9	1.9	–	2.3	31	41	51
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 8-6-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
0100	2.2	4.1	1.5	3.1	0.6	1.5	4.2	19.5	2.5	0.9	NA	1.1	1.5	1.9	1.2	1.6	-	3.3	22	47	66
0200																					
0300	3.0	2.6	1.2	2.3	0.5	1.0	4.0	14.6	2.3	0.6	NA	1.5	1.3	NA	1.3	1.8	-	3.4	20	42	57
0400																					
0500	2.3	2.6	1.0	2.6	0.5	1.1	3.7	15.9	2.7	0.6	NA	NA	NA	NA	0.6	1.6	-	3.3	26	45	61
0600																					
0700	2.7	2.0	0.7	2.9	0.5	1.2	2.4	12.4	2.0	0.8	NA	1.5	1.4	2.0	1.2	2.4	0.8	3.6	25	44	58
0800																					
0900	2.2	1.3	0.7	2.0	0.5	1.6	2.6	10.9	2.8	1.2											
1000																					
1100	2.0	1.2	0.7	2.4	0.2	0.7	2.1	9.3	1.7	1.1	NA	3.1	2.5	10	1.9	2.9	-	4.4	15	42	51
1200																					
1300	2.3	0.8	0.5	2.1	1.7	0.7	1.9	10.1	1.5	1.0	NA	1.2	0.6	4.3	0.2	0.4	-	2.7	32	45	56
1400																					
1500	2.1	0.9	0.4	1.2	0.3	0.9	1.1	6.9	1.4	1.3	NA	1.9	3.1	NA	2.1	3.1	-	2.8	29	45	[illegible]
1600																					
1700	2.0	0.7	0.4	1.9	-	-	0.8	5.9	1.2	0.7	NA	2.2	1.0	5.4	1.1	0.6	-	2.7	30	48	54
1800																					
1900	1.7	0.7	0.4	0.9	0.2	0.4	0.9	5.1	0.5	2.5	NA	1.2	0.7	7.2	0.9	0.6	-	3.1	25	42	47
2000																					
2100	1.9	0.7	0.5	1.4	0.3	0.4	1.0	6.1	0.7	0.9	NA	1.0	0.7	4.4	0.5	0.4	-	2.9	23	34	40
2200																					
2300	3.5	1.2	0.9	2.1	0.4	1.0	2.1	11.1	1.7	0.3	NA	1.6	1.5	4.3	1.0	1.1	-	3.2	25	40	51
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 8-7-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	N-BUTANE	Σ1 THRU 7	N-HEXANE	BENZENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p-XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	NMHC ②	TOTAL HC ③
0100	3.4	2.6	1.0	4.0	0.9	2.6	5.5	19.9	2.9	0.7	NA	1.3	1.5	5.6	1.5	2.1	–	3.7	47	66	86
0200																					
0300	3.1	2.2	0.8	4.3	0.7	2.6	5.6	19.3	3.1	0.7	NA	1.2	1.3	3.5	1.2	1.8	0.5	3.9	36	42	61
0400																					
0500	3.7	2.6	0.7	4.3	0.7	2.3	4.7	17.0	4.2	0.9	NA	1.0	0.9	NA	1.8	2.4	–	3.6	43	59	77
0600																					
0700	3.4	3.0	1.0	4.6	0.7	1.8	3.5	18.0	3.6	1.0	NA	1.3	1.2	NA	2.0	3.0	1.0	3.9	56	74	90
0800																					
0900	2.0	1.9	0.8	2.9	0.4	1.1	2.7	12.8	1.6	1.7	NA	1.3	NA	NA	2.6	4.5	0.2	3.3	74	89	104
1000																					
1100	2.1	1.0	0.5	1.4	0.2	1.1	1.4	7.7	1.3	0.6	NA	1.3	1.7	3.5	0.9	1.3	–	3.6	24	38	46
1200																					
1300	1.9	1.0	0.3	1.1	–	0.5	0.9	5.6	1.3	0.6											
1400																					
1500	1.7	1.2	0.3	1.0	–	0.3	0.7	5.2	1.5	0.9	1.4	1.2	1.2	4.2	0.3	0.3	–	3.1	21	35	40
1600																					
1700	1.5	1.1	0.3	0.9	0.4	0.2	0.6	4.9	1.1	0.8											
1800																					
1900	1.4	0.9	0.3	0.9	0.2	0.7	0.7	5.2	1.0	1.6	0.9	0.9	0.8	2.7	0.3	0.3	–	2.2	21	32	37
2000																					
2100	11.9	2.5	0.5	1.4	0.3	0.3	0.9	24	1.1	1.3	1.9	1.7	1.6	3.0	0.7	1.1	–	2.9	25	40	64
2200																					
2300	2.6	0.9	0.4	1.6	0.3	0.7	1.1	7.6	1.1	0.5	1.4	1.6	1.4	3.5	0.5	0.6	–	3.1	26	40	48
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 8 - 8 - 75 $\mu g/m^3$

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	i-BUTANE	n-BUTANE	Σ 1 THRU 7	n-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	H.H.C. ②	N.M.T.H.C. ③
0100	3.4	2.0	0.6	2.5	0.5	1.3	2.8	13.0	2.2	0.6	1.5	1.2	1.3	4.0	0.3	0.5	-	5.3	46	64	77
0200																					
0300	3.2	2.3	0.7	3.2	0.8	0.8	2.0	13.0	1.5	0.6	1.2	1.5	1.2	5.2	0.9	1.0	-	7.1	35	56	69
0400																					
0500	4.2	2.4	0.9	4.3	0.7	1.0	2.5	16.0	1.9	0.6	1.5	1.4	1.1	4.9	0.4	0.6	-	6.4	37	56	72
0600																					
0700	3.9	2.6	0.9	4.9	0.5	1.5	3.1	17.4	1.9	0.9	2.0	1.4	1.1	6.2	1.2	1.7	-	6.5	37	61	78
0800																					
0900	3.0	1.6	0.7	3.8	0.4	1.8	4.1	15.4	2.1	1.7	2.1	3.0	2.3	4.0	0.4	0.6	0.2	4.4	41	61	76
1000																					
1100	2.7	0.8	0.6	2.1	-	0.9	2.1	9.2	1.2	1.3	4.0	0.3	0.9	0.8	0.3	0.4	0.2	0.9	27	37	46
1200																					
1300	2.6	0.9	0.6	2.7	-	1.3	4.6	12.7	1.5	1.8	5.1	2.6	2.9	2.8	0.4	0.2	-	0.6	18	35	48
1400																					
1500	3.2	1.3	0.7	2.7	0.3	1.7	4.8	16.0	2.7	2.8	5.2	0.9	2.8	2.9	0.8	0.5	-	0.6	33	62	64
1600																					
1700	2.2	1.2	2.1	3.9	0.2	2.6	5.1	18.4	2.4	3.6	5.1	0.8	0.9	1.8	0.6	0.7	-	0.9	50	66	84
1800																					
1900	3.0	1.2	2.7	3.0	0.3	2.2	5.6	19.0	2.7	2.9	3.6	1.5	0.9	2.3	0.7	0.6	-	2.6	48	67	86
2000																					
2100	3.2	1.6	1.1	3.5	0.6	1.5	4.8	16.3	2.6	1.7	2.9	1.7	2.0	2.7	0.6	1.1	0.2	2.5	53	71	87
2200																					
2300	3.5	1.5	0.7	2.5	0.4	2.9	2.0	13.5	0.8	NA	1.8	1.7	1.7	2.6	0.6	1.0	-	2.7	33	46	59
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL 9 THRU COL 19 ③ Σ COL 8 AND COL 20

DATE 8-9-75

µg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	(21)
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPYLENE	I-BUTANE	N-BUTANE	Σ BUTENES	I-PENTANE	BENZENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m,p-XYLENE	α PINENE	UNKNOWN #3	OTHER ①	ΣC6+ ②	ΣTOTAL ③
0100	3.6	2.0	0.8	3.4	0.4	0.9	2.6	14	1.5	0.6	2.3	2.0	1.6	7.1	0.9	1.5	-	3.5	36	53	67
0200																					
0300	4.5	3.5	1.7	7.4	1.2	6.5	20	45	5.8	1.9	6.5	1.6	1.9	1.8	1.4	3.1	-	3.1	40	67	112
0400																					
0500	4.8	4.9	2.6	6.9	1.3	5.3	16	42	6.5	1.7	10.5	1.4	1.8	2.0	2.2	5.2	-	2.8	57	88	130
0600																					
0700	3.9	4.0	2.2	5.4	1.1	2.8	12	32	4.5	1.6	10.0	1.4	1.6	1.6	3.0	4.0	0.4	2.7	89	119	151
0800																					
0900	2.7	1.4	1.1	2.9	0.4	0.4	3.5	12	2.0	1.5	3.6	1.7	1.3	1.9	0.4	0.9	0.2	2.3	34	50	62
1000																					
1100	2.4	1.2	0.5	1.5	0.4	0.9	1.2	8.0	1.2	0.4	3.6	2.0	1.7	2.4	-	-	-	-	26	37	45
1200																					
1300	1.9	0.8	0.4	1.2	0.3	0.6	0.7	6.9	1.1	1.7	1.2	2.2	1.3	1.1	-	-	-	1.5	14	24	30
1400																					
1500																					
1600																					
1700	2.6	0.9	0.5	1.4	0.4	0.3	1.0	7.0	1.2	3.1	1.0	0.3	0.4	1.1	-	-	-	0.4	19	27	34
1800																					
1900	3.6	1.0	0.7	2.6	0.2	1.1	2.6	12	1.6	4.6	1.2	1.0	0.8	1.0	0.3	0.3	-	0.8	21	33	45
2000																					
2100	5.6	1.7	1.5	6.7	0.3	3.2	8.2	27	3.6	1.8	2.8	0.7	1.5	14	0.5	0.7	-	0.6	51	65	92
2200																					
2300	5.1	2.0	1.6	6.2	0.4	2.1	9.4	25	3.7	1.1	3.6	1.0	2.2	1.7	0.7	1.4	-	0.5	55	71	96
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 5-10-75 μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	N-BUTANE	Σ①THRU⑦	N-PENTANE	BENZENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	M-XYLENE	O-XYLENE	UNKNOWN #3	OTHERS ①	[illegible] ②	TOTAL ③
0100	4.4	4.3	2.4	5.0	0.9	2.0	6.5	25.5	3.8	1.3	4.4	1.1	1.8	1.0	1.0	0.5	-	1.3	41	69	95
0200																					
0300	3.1	2.7	1.3	4.6	0.6	1.0	3.1	16.4	2.2	2.9	3.8	1.9	1.7	2.2	0.7	1.6	0.2	2.0	41	60	76
0400																					
0500	3.0	1.9	0.8	3.3	0.3	0.7	1.9	11.9	1.4	3.2	8.1	1.5	0.8	2.1	0.6	0.9	0.2	6.4	29	44	56
0600																					
0700	3.2	2.3	1.0	4.5	0.5	0.2	2.4	14.1	1.7	2.5	7.6	1.6	1.9	3.1	0.8	1.4	0.2	2.7	24	52	66
0800																					
0900	3.0	1.2	0.6	2.9	0.6	0.7	1.6	10.6	1.3	8.3	5.0	1.4	1.9	2.3	0.9	1.4	0.6	1.7	26	54	65
1000																					
1100	2.4	1.0	0.4	1.7	0.4	0.9	1.5	8.6	1.1	7.0	9.6	1.7	1.9	2.8	0.6	0.6	-	1.6	19	39	48
1200																					
1300	2.2	0.9	0.7	1.6	0.3	0.9	0.9	7.5	1.0	4.4	2.0	2.5	1.7	1.9	0.4	0.4	-	1.6	13	29	37
1400																					
1500	2.4	0.9	0.7	1.9	0.6	0.9	1.3	8.6	1.1	6.9	5.6	2.0	4.1	1.9	0.6	0.5	-	1.9	23	46	[illegible]
1600																					
1700	2.3	0.7	0.7	1.6	0.2	0.5	1.4	7.4	1.4	5.7	7.2	8.1	1.7	4.3	0.7	0.5	-	1.9	24	45	52
1800																					
1900	2.6	0.9	0.8	1.7	-	0.6	1.7	8.4	1.3	7.0	3.4	2.8	2.4	2.7	0.6	0.5	-	2.2	23	57	65
2000																					
2100	2.7	1.1	0.8	2.7	1.1	0.7	2.0	11.5	1.7	7.6	4.2	2.0	2.2	3.5	0.6	0.9	-	1.8	22	55	67
2200																					
2300	2.6	1.4	0.9	2.7	0.6	0.6	1.9	10.7	1.9	4.3	2.6	1.9	1.1	2.1	0.4	0.6	-	2.0	25	54	65
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 8-11-75

$\mu g/m^3$

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	N-BUTANE	Σ 1 THRU 7	N-PENTANE	BENZENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m-p XYLENE	o-XYLENE	UNKNOWN #3	OTHERS ①	[illegible] ②	[illegible] ③
0100	3.4	2.4	0.8	3.3	0.5	0.9	2.0	13.1	1.7	9.7	5.5	2.1	1.9	2.5	0.7	1.1	0.4	2.6	30	59	74
0200																					
0300	3.7	2.1	0.8	4.0	0.5	0.8	2.0	13.9	1.6	9.5	3.7	2.2	1.6	2.4	0.6	1.0	0.3	2.5	24	52	66
0400																					
0500	4.3	1.8	0.6	4.1	0.4	1.1	1.9	14.2	1.5	8.2	1.2	1.6	0.6	1.3	0.3	0.7	-	2.4	17	35	49
0600																					
0700	5.1	2.1	0.6	4.5	0.4	1.3	1.9	15.9	1.5	5.8	0.9	1.4	0.6	3.1	0.7	0.6	-	2.6	27	43	59
0800																					
0900	5.0	0.9	0.6	4.4	0.2	1.2	2.7	15.0	1.6	4.4	2.2	1.6	0.9	1.6	0.4	2.5	0.2	1.9	27	45	60
1000																					
1100	4.3	1.0	0.6	3.6	0.3	1.1	1.8	12.7	1.9	5	4.4	2.5	2.2	3.2	0.6	0.6	-	1.4	36	52	65
1200																					
1300	3.4	0.8	0.6	2.6	0.3	0.7	1.5	9.9	1.2	5	4.1	2.0	2.2	2.3	0.4	0.5	0.2	1.7	36	51	61
1400																					
1500	6.6	1.1	0.6	4.9	0.9	1.0	2.5	16.6	1.5	2.2	4.4	3.0	3.0	3.0	0.6	0.6	-	2.2	30	51	
1600																					
1700	5.9	1.1	0.6	4.5	0.2	1.4	2.7	16.3	1.9	5.4	1.3	2.1	1.3	2.7	0.3	0.4	-	1.8	38	55	71
1800																					
1900	4.5	1.0	0.6	4.0	0.4	1.3	3.3	14.5	2.0	8.4	1.7	3.1	1.4	2.7	0.3	0.3	-	1.9	42	64	79
2000																					
2100	5.0	1.7	0.9	5.8	0.5	1.2	2.1	17.2	2.3	6.4	3.5	2.4	2.6	5.9	0.7	1.0	0.7	1.8	37	65	83
2200																					
2300	5.5	2.5	1.7	4.7	0.7	1.4	4.5	21.0	3.3	7.9	3.6	3.4	2.0	2.1	0.7	1.4	0.3	2.0	51	73	94
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 8-12-75 $\mu g/m^3$

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPYLENE	I-BUTANE	N-BUTANE	Σ1 THRU 7	[illegible]	[illegible]	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p XYLENE	[illegible]	UNKNOWN #3	OTHERS ①	ΣHC ②	ΣTOTAL ③
0100	4.9	2.4	1.0	4.7	1.0	2.1	3.3	19	4.1	18	4.3	2.9	2.3	4.7	1.1	1.9	0.2	2.4	39	81	100
0200																					
0300	6.6	1.9	0.6	5.1	1.2	1.3	2.7	19	[illegible]	21	3.6	2.2	1.5	1.9	0.3	0.3	-	2.2	39	74	92
0400																					
0500	7.5	1.7	0.6	6.6	0.5	1.6	3.2	22	2.2	12	3.2	1.9	1.5	2.7	0.3	0.4	0.2	2.2	40	67	89
0600																					
0700	9.5	2.0	0.7	8.1	0.6	2.0	3.6	27	2.4	3.6	3.7	1.6	1.2	2.2	0.2	0.3	-	2.3	32	50	77
0800																					
0900	13	0.8	0.6	9.9	0.2	2.2	5.0	31	2.6	3.7	5.5	1.9	2.2	2.7	0.6	0.7	0.2	1.7	37	55	86
1000																					
1100	9.5	0.6	0.6	7.4	0.2	1.9	4.7	25	2.2	8.4	4.0	2.0	2.6	2.9	0.7	0.9	-	2.0	28	54	79
1200																					
1300																					
1400																					
1500	6.6	0.2	0.3	4.5	-	1.0	2.1	15	1.8	5.1	6.3	2.1	2.1	7.6	0.9	0.9	0.2	2.3	30	59	[illegible]
1600																					
1700	6.7	0.9	0.5	4.7	0.3	1.0	2.2	16	1.7	19	4.8	2.6	1.7	7.6	0.9	0.9	-	2.9	38	79	95
1800																					
1900	6.9	1.1	0.7	5.1	0.2	1.3	3.4	19	3.4	9.7	3.3	2.6	2.1	4.4	0.3	0.3	-	2.4	43	71	90
2000																					
2100	7.2	2.0	1.6	5.9	0.6	2.0	5.7	25	3.8	3.0	4.2	1.5	1.5	3.9	0.9	1.5	0.2	1.8	58	80	105
2200																					
2300	9.0	2.2	1.9	6.7	1.5	2.2	5.7	29	4.0	5.6	6.5	2.4	2.6	4.9	1.0	2.7	0.2	2.4	67	101	130
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

DATE 8-13-75

μg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	N-BUTANE	I-PENTANE	N-PENTANE	ISOPRENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m&p-XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	NMHC ②	ΣTNMHC ③
0100	7.1	2.1	0.7	5.7	0.6	14	2.7	20	17	16	6.6	1.5	1.8	4.4	0.3	0.6	0.2	3.4	43	78	78
0200																					
0300	7.0	1.7	0.6	5.9	0.4	1.4	2.6	17	1.8	11	2.0	2.2	1.2	4.9	0.5	0.5	0.4	2.8	44	71	90
0400																					
0500	7.3	1.9	0.6	6.0	0.3	1.5	2.7	20	2.1	6.9	5.9	2.9	2.5	5.1	0.9	1.1	-	2.8	21	44	69
0600																					
0700	7.5	2.2	0.7	6.2	0.4	1.5	2.2	22	2.3	2.0	4.3	3.2	2.2	4.6	0.6	0.7	0.3	2.5	22	45	67
0800																					
0900	6.2	5.4	0.9	5.7	0.6	1.4	2.2	23	2.1	2.2	7.7	17	1.0	1.8	0.6	0.9	0.5	2.6	39	62	95
1000																					
1100	5.3	1.1	0.7	4.6	0.2	1.1	2.7	16	1.9	2.3	28	12	2.7	3.7	1.1	1.0	0.6	2.1	51	34	78
1200																					
1300	5.1	1.2	0.6	4.3	0.3	1.5	2.3	15	1.7	1.6	4.1	6.9	3.2	4.8	0.7	0.7	34	2.2	44	65	91
1400																					
1500	4.4	1.0	0.4	3.5	0.3	0.9	2.0	13	1.6	1.2	2.2	2.0	1.0	2.9	0.5	0.5	0.2	1.9	33	48	/
1600																					
1700	3.6	1.3	0.4	4.0	0.2	0.9	2.3	15	1.5	1.3	0.9	2.7	1.1	3.8	0.3	0.2	-	2.0	30	44	54
1800																					
1900	6.3	1.0	0.4	3.7	0.3	0.9	1.9	14	1.5	6.3	11	1.2	0.6	2.9	0.2	-	-	1.7	29	44	56
2000																					
2100	4.5	1.1	0.5	4.0	0.3	0.9	2.2	14	1.8	2.7	1.9	1.5	0.7	4.5	0.3	0.3	0.3	1.1	26	41	56
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL.9 THRU COL.19 ③ Σ COL.8 AND COL.20

DATE 8-14-76

µg/m³

COL.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
TIME IN HOURS	ETHANE	ETHYLENE	ACETYLENE	PROPANE	PROPENE	I-BUTANE	N-BUTANE	Σ1 THRU 7	I-PENTANE	BENZENE	TOLUENE	UNKNOWN #1	OCTANE	UNKNOWN #2	ETHYLBENZENE	m-XYLENE	α PINENE	UNKNOWN #3	OTHERS ①	RHC ②	ΣNMHC ③
0100	4.7	2.1	0.5	5.4	0.5	1.0	2.3	17	1.9	2.2	1.3	1.6	0.9	4.6	0.6	1.2	1.4	3.0	24	48	65
0200																					
0300	5.0	2.1	0.5	5.6	0.3	1.1	2.5	17	2.1	2.1	1.7	16	0.7	4.4	0.6	0.9	0.9	2.9	27	45	62
0400																					
0500	5.1	2.3	0.5	5.4	0.3	1.2	2.3	17	2.0	1.3	2.0	1.6	1.4	4.9	0.6	1.0	0.9	2.6	27	45	62
0600																					
0700	5.9	2.3	0.6	5.4	0.3	1.2	2.5	19	1.9	1.0	2.9	1.7	1.1	4.9	0.9	1.4	0.4	2.4	23	41	59
0800																					
0900																					
1000																					
1100																					
1200																					
1300																					
1400																					
1500																					
1600																					
1700																					
1800																					
1900																					
2000																					
2100																					
2200																					
2300																					
2400																					

① OTHER PROBABLE HYDROCARBONS ② Σ COL. 9 THRU COL. 19 ③ Σ COL. 8 AND COL. 20

GLASGOW, ILL.

C_2 THRU C_4
C_5 THRU C_{10} in $\mu g/m^3$

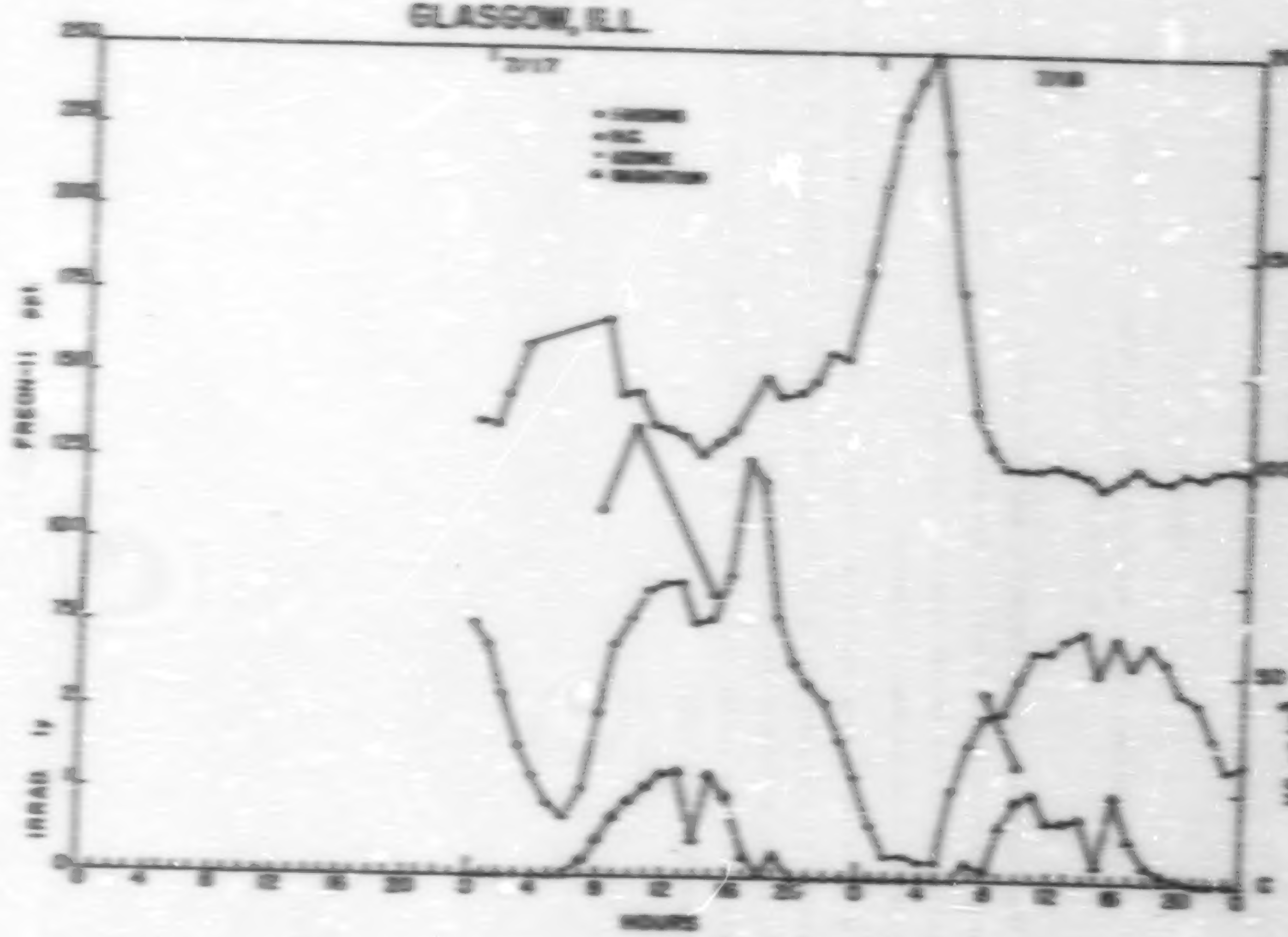
	JULY 1975																AUGUST 1975													
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0000										[illegible]					[illegible]	[illegible]														
0100																	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0200										[illegible]					[illegible]	[illegible]		[illegible]												
0300																			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0400										[illegible]					[illegible]	[illegible]		[illegible]												
0500																			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0600																[illegible]		[illegible]												
0700																			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0800	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]						[illegible]		[illegible]												
0900								[illegible]							[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			[illegible]						[illegible]	[illegible]	[illegible]												
1100								[illegible]		[illegible]					[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1200				[illegible]			[illegible]							[illegible]		[illegible]		[illegible]												
1300								[illegible]		[illegible]					[illegible]		[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
1400			[illegible]	[illegible]	[illegible]											[illegible]														
1500	[illegible]	[illegible]						[illegible]		[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		
1600																[illegible]														
1700		[illegible]								[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
1800																														
1900															[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2000																														
2100									[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2200																														
2300															[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

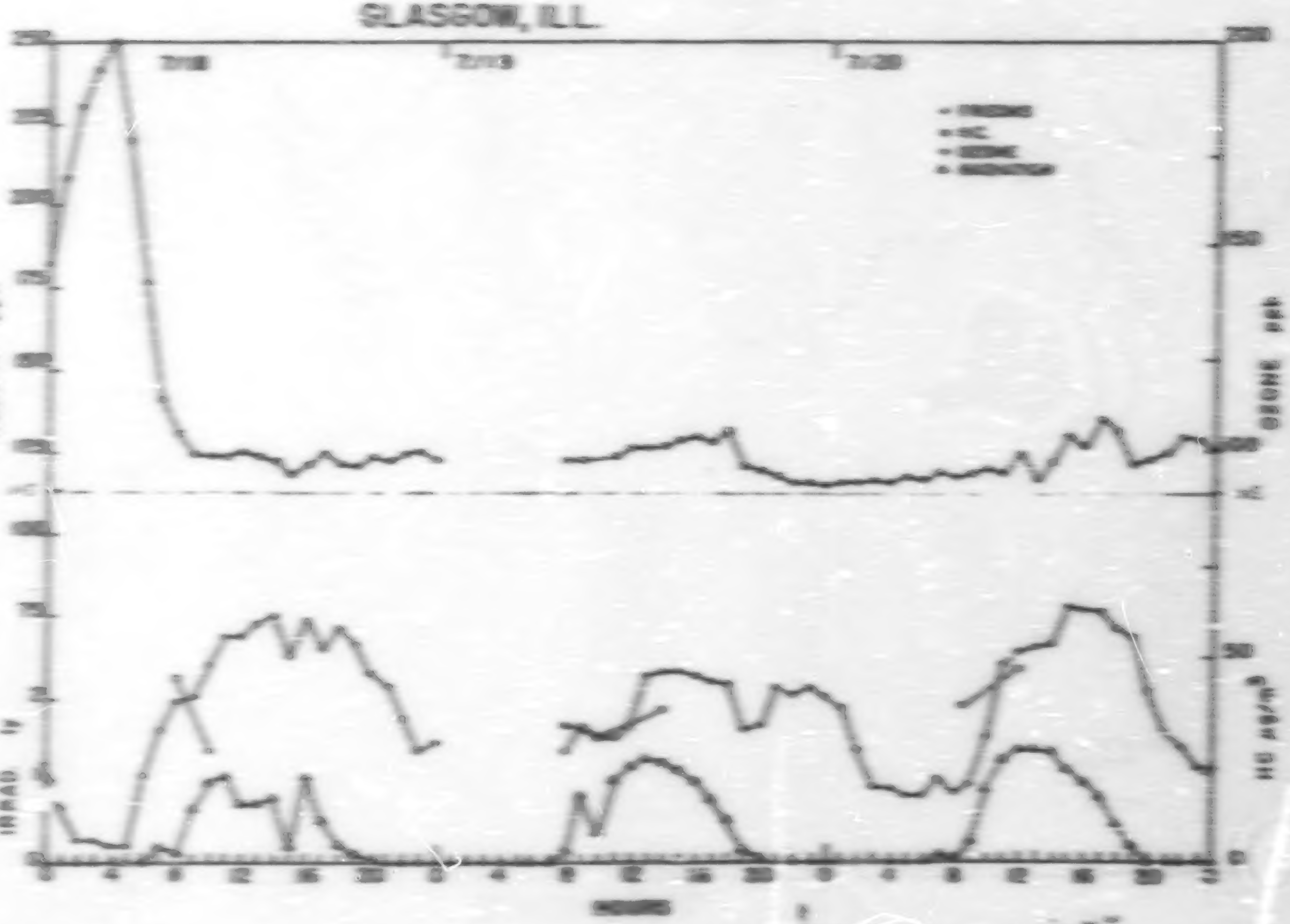
Appendix B

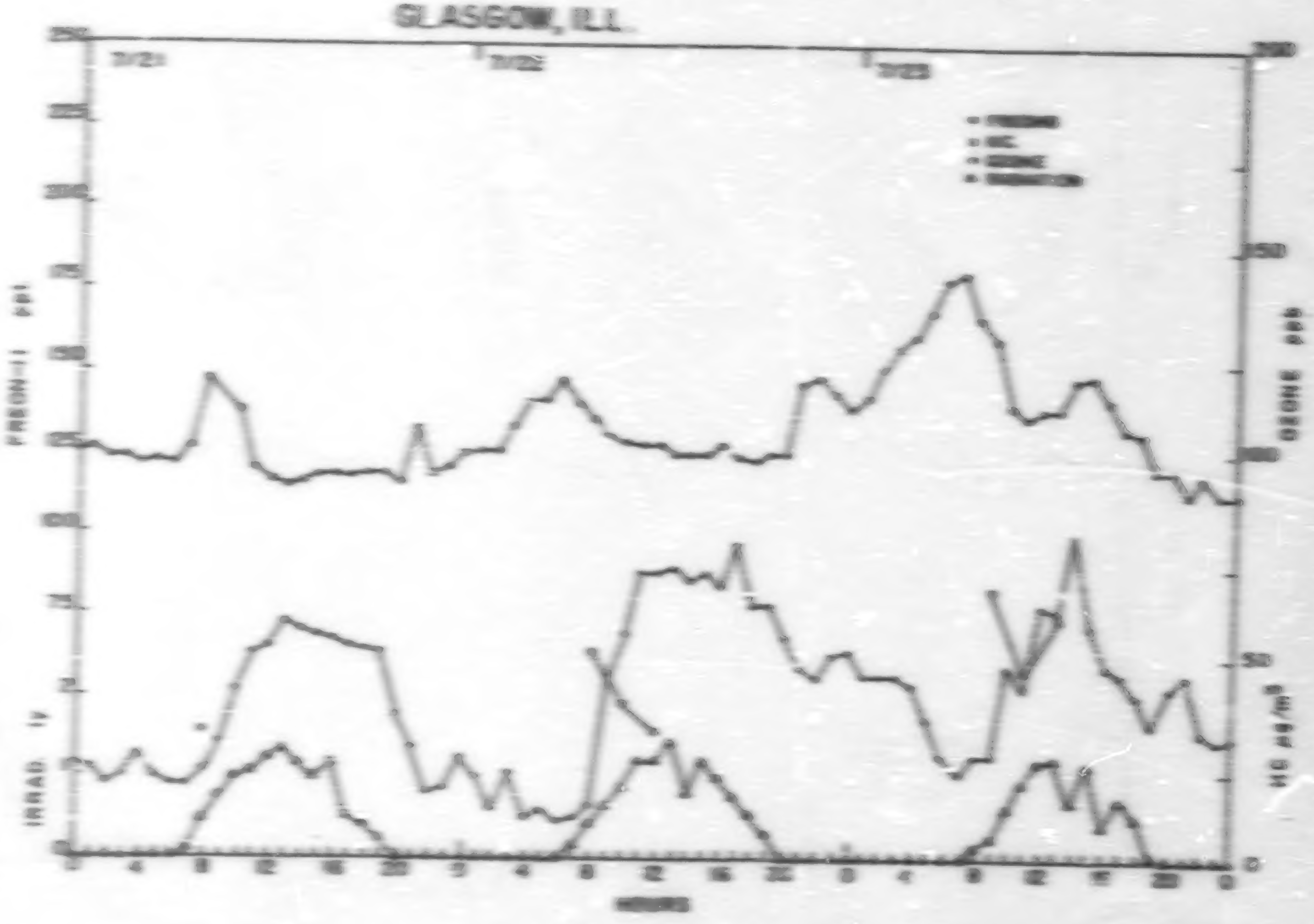
Halocarbon, Ozone, and Wind Data and Graphs for Sampling at Glasgow, Illinois

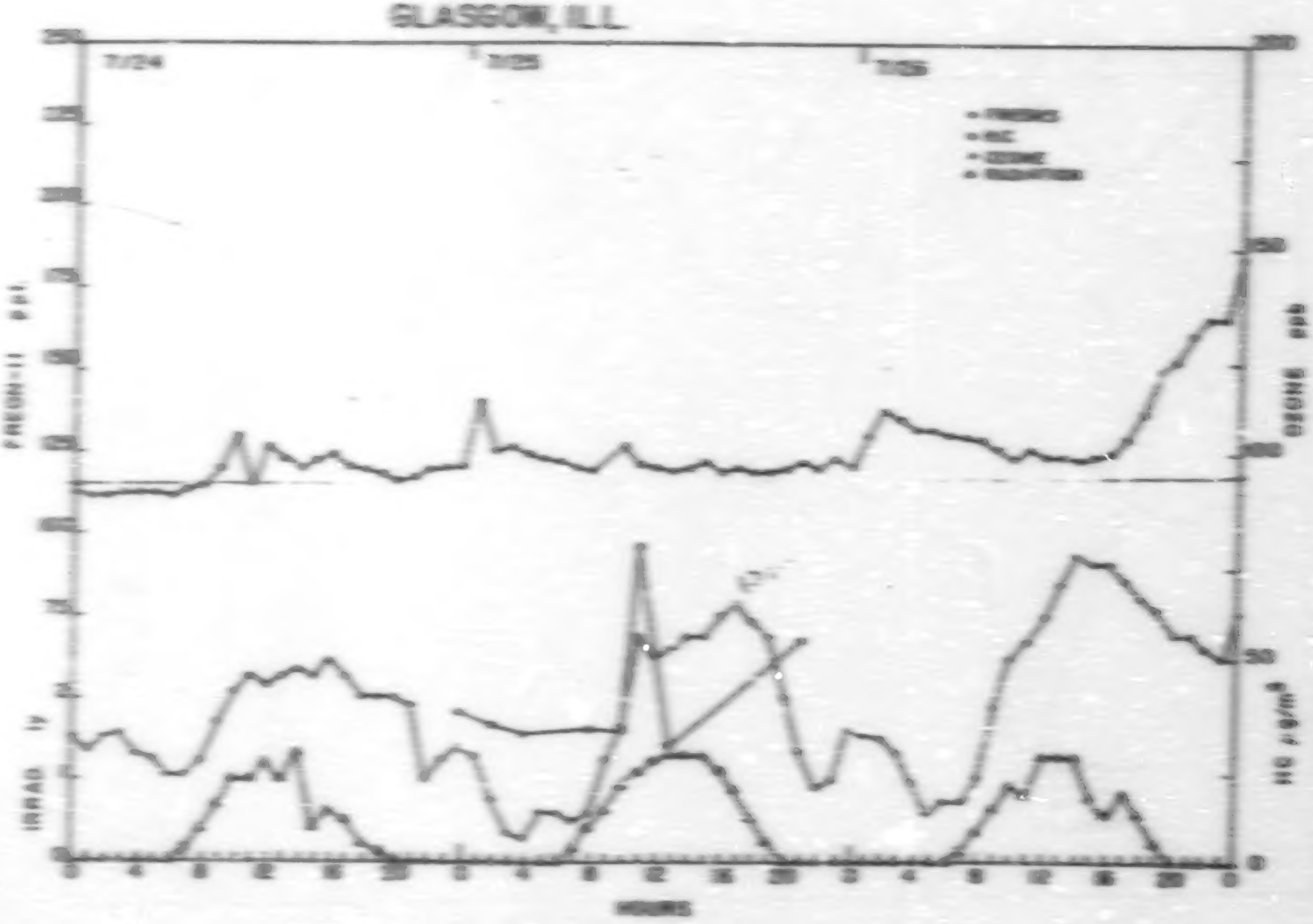
The following tables summarize the halocarbon, ozone, wind and radiation measurements made continuously at Glasgow, Illinois. Units for each variable are indicated at the column heading. See the body of this report for description of measurement technique.

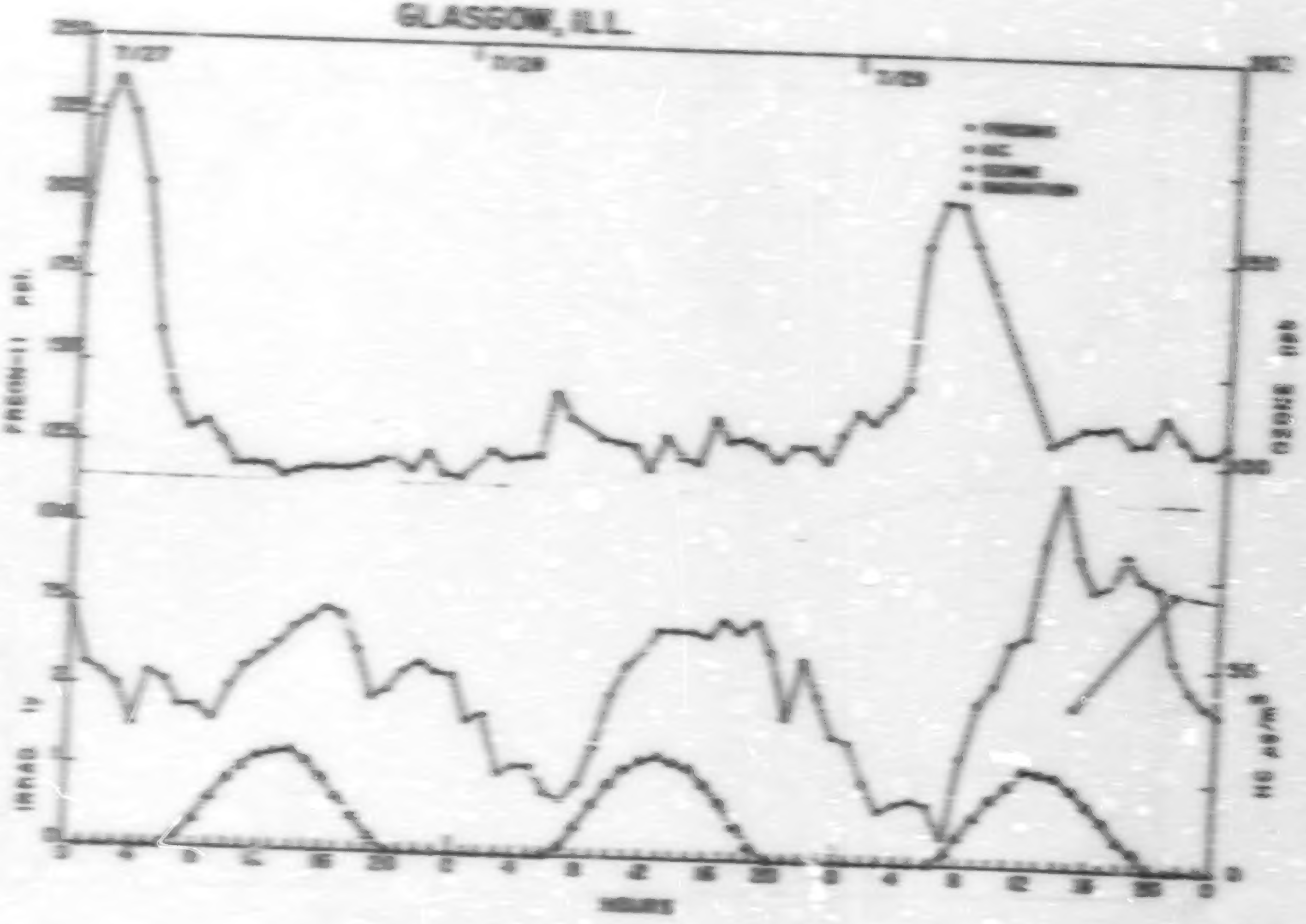
We find the graphs presented a clear way of summarizing the data. Cloudy and stormy days are indicated by irregular radiation profiles and clear days are indicated by sinusoidal radiation profile. Urban air intrusions are clearly marked by sudden increases in the fluorocarbon-11 concentration above a minimum baseline value.

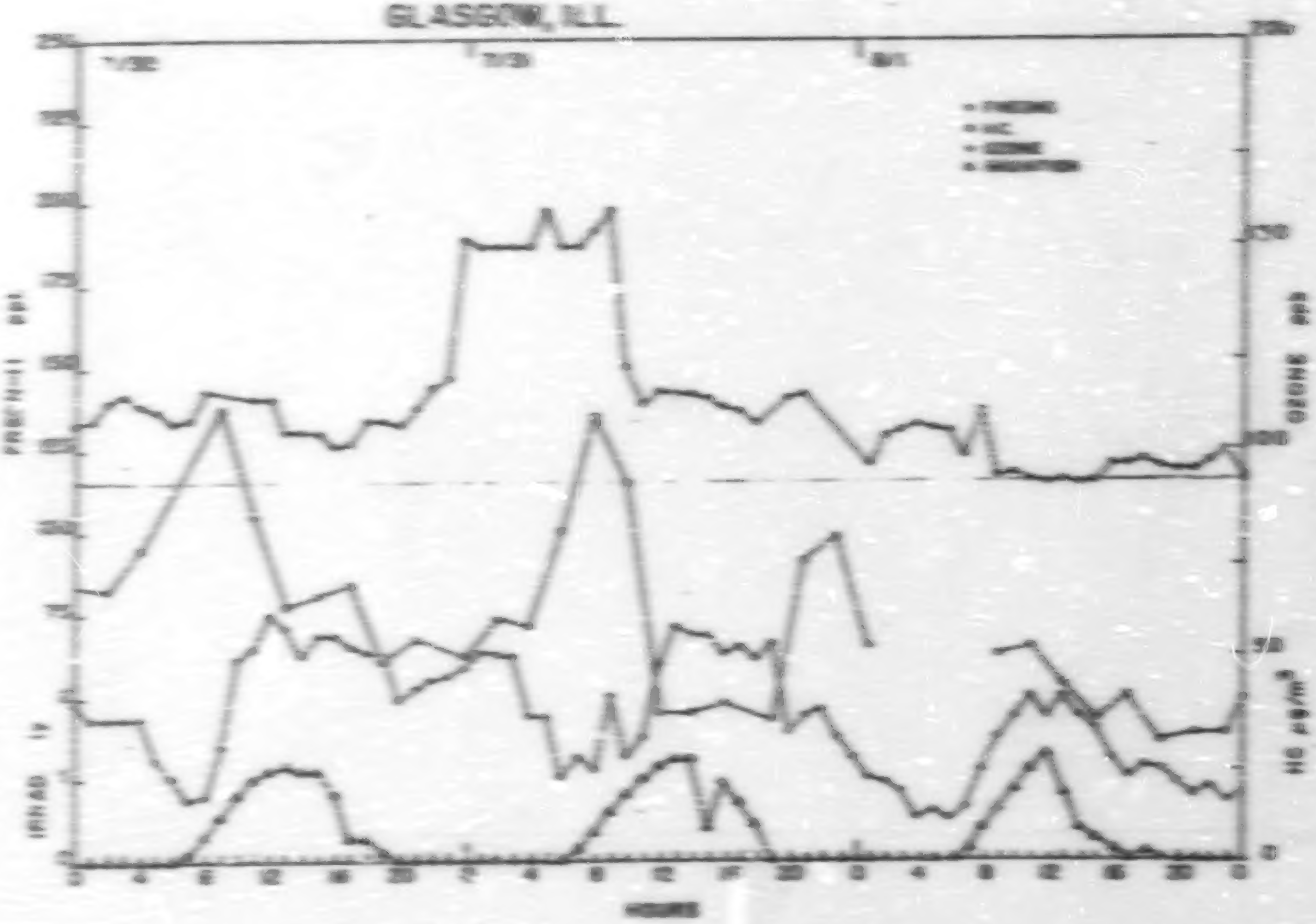

GLASGOW, ILL.
7/17
7/18
FREON-11 ppt
IRRAD ly
OZONE ppb
HC µg/m³
HOURS
0
25
50
75
100
125
150
175
200
225
250
0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0

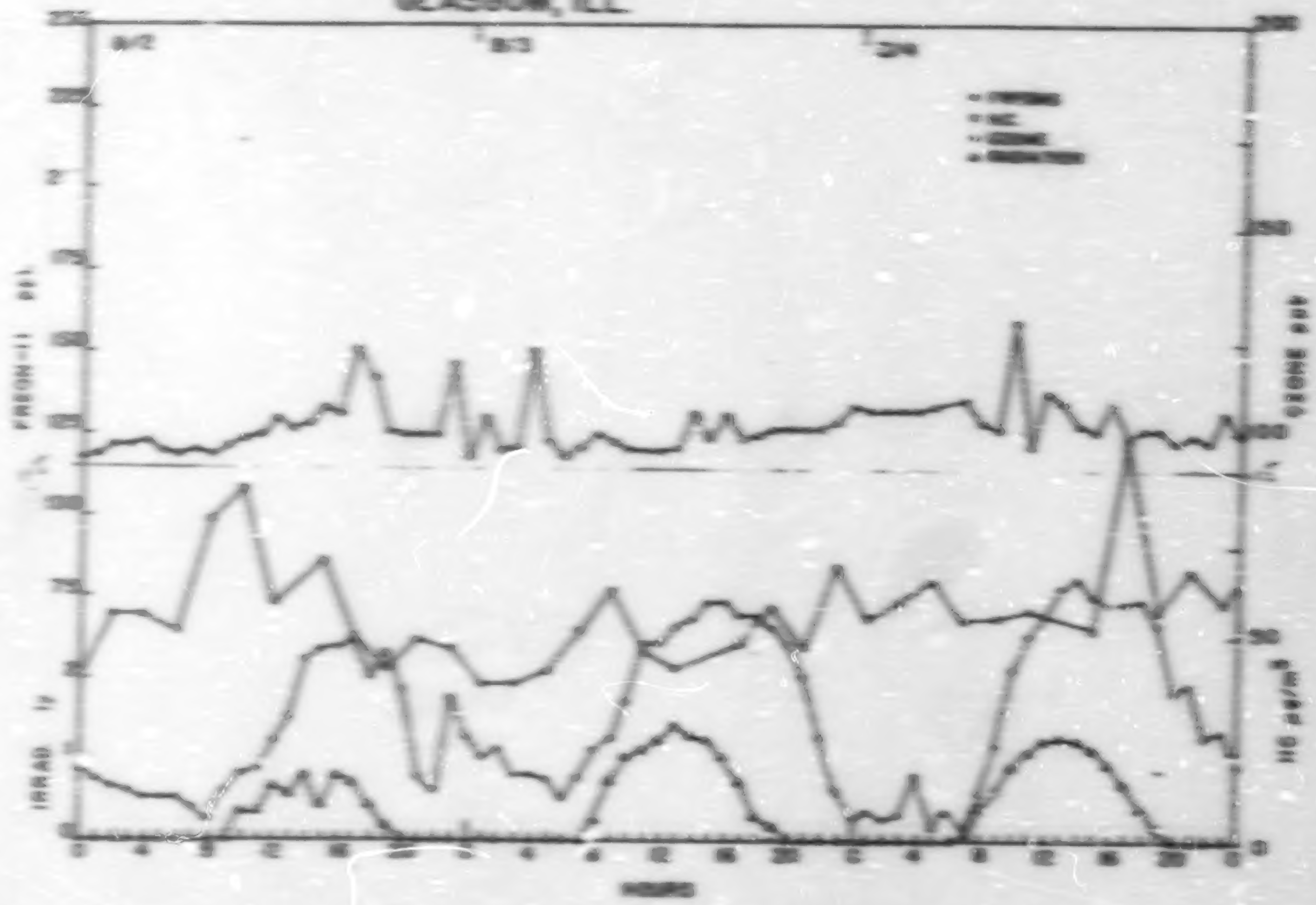

GLASGOW, ILL.
7/18
7/19
7/20
FREON-11 ppt
OZONE ppb
IRRAD ly
HC µg/m³
HOURS
HC
250
200
150
100
50
0

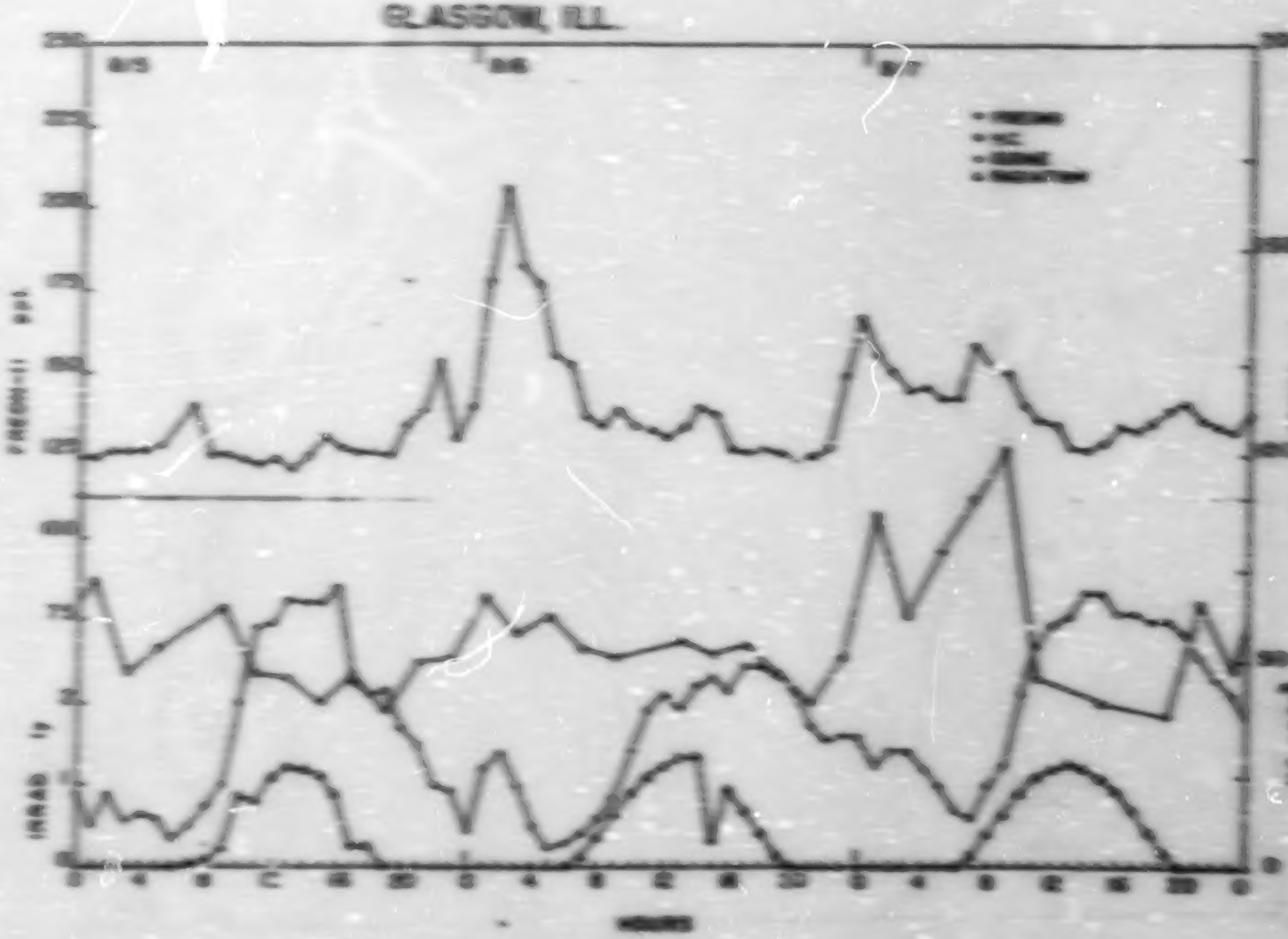

GLASGOW, ILL.
7/21
7/22
7/23
FREON11
HC
OZONE
RADIATION
FREON-11 ppt
IRAD ly
OZONE ppb
HC µg/m³
250
225
200
175
150
125
100
75
50
25
0
300
250
200
150
100
50
0
HOURS
0
4
8
12
16
20

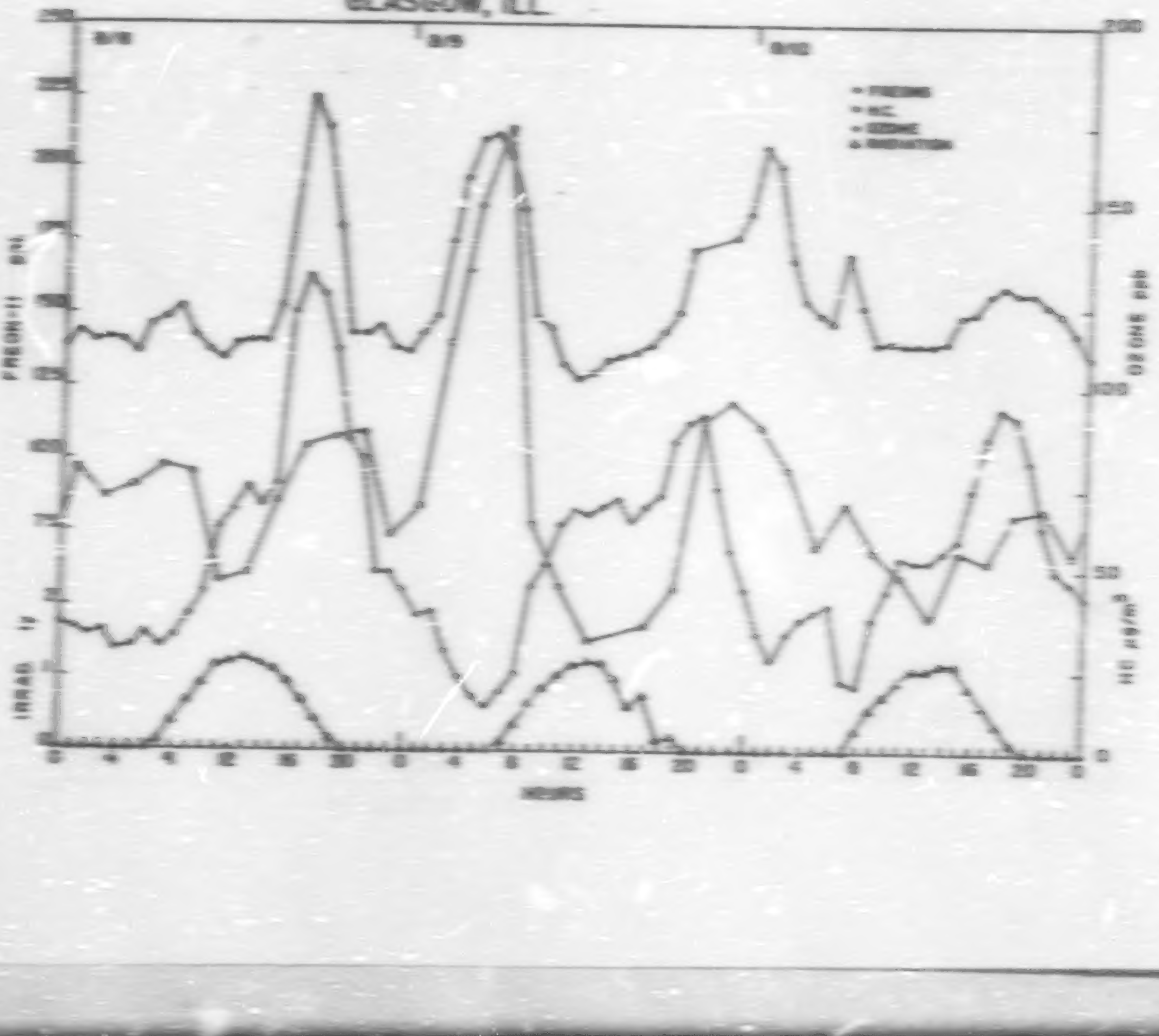

GLASGOW, ILL.
7/24
7/25
7/26
FREON
HC
OZONE
RADIATION
FREON-11 ppt
250
225
200
175
150
125
100
75
50
25
IRRAD ly
OZONE ppb
200
150
100
50
0
HC μg/m³
HOURS
0
4
8
12
16
20

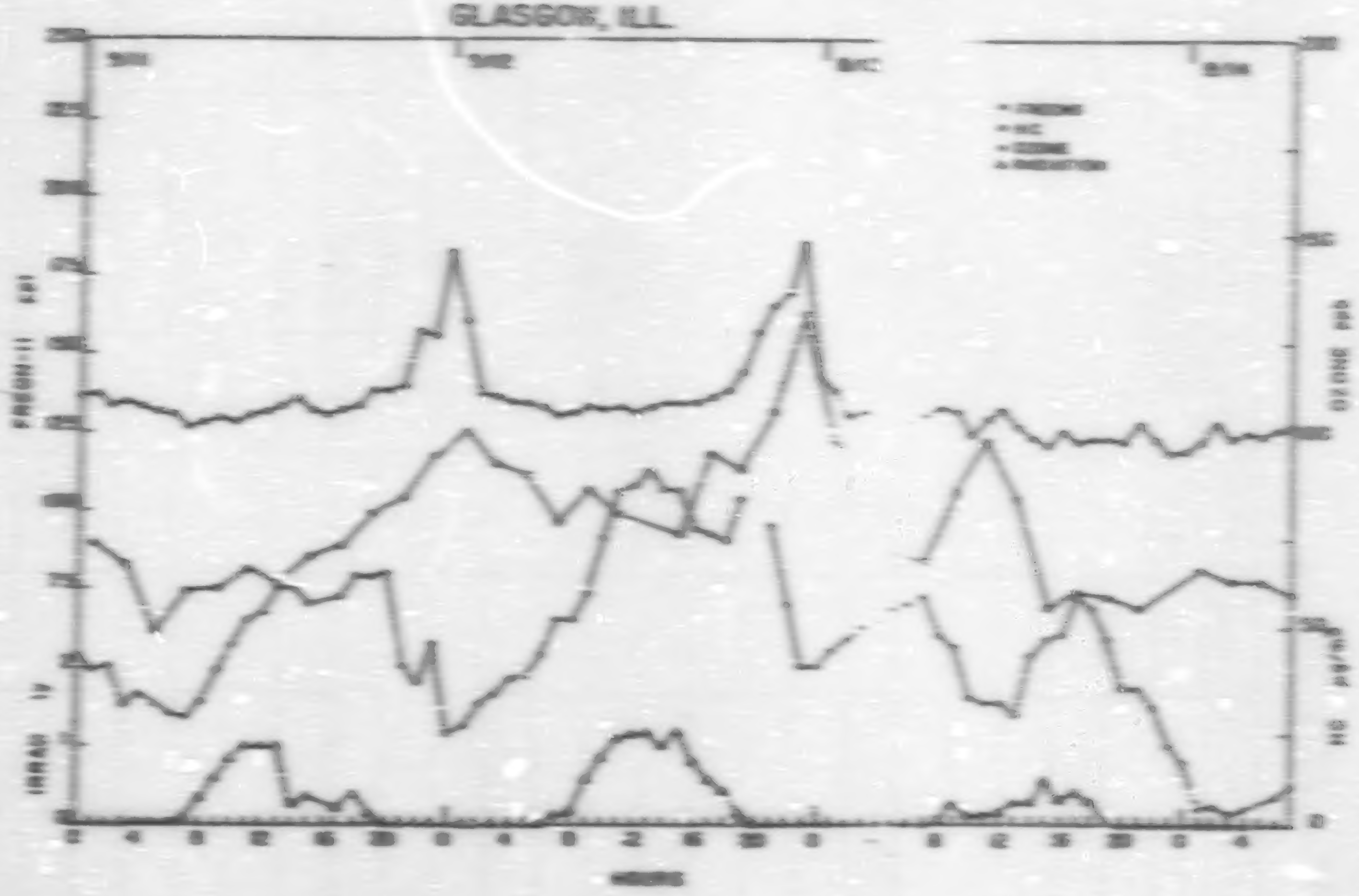

GLASGOW, ILL.
7/27
7/28
7/29
FREON-11 PPT
OZONE PPB
IRRAD
HC µg/m³
HOURS
250
200
175
150
125
100
75
50
25
0


GLASGOW, ILL.
7/30
7/31
8/1
FREON-11 ppt
IRRAD ly
OZONE ppb
HC µg/m³
HOURS
250
200
175
150
125
0

GLASGOW, ILL.
8/2
8/3
8/4
FREON-11 ppt
225
200
175
150
125
100
75
50
25
0
IRRAD ly
OZONE ppb
HC µg/m³
0
4
8
12
16
20
HOURS


GLASGOW, ILL.
8/5
8/6
8/7
FREON-11 PPT
OZONE PPB
IRRAD
HC PPM
HOURS
250
225
200
175
150
125
0


GLASGOW, ILL.
9/8
9/9
9/10
FREON
H.C.
OZONE
RADIATION
FREON-11 ppt
250
225
200
175
150
125
100
75
50
25
IRRAD ly
OZONE ppb
200
150
100
50
0
HC µg/m³
0
4
8
12
16
20
HOURS


GLASGOW, ILL.
FREON-11 ppt
IRRAD ly
OZONE ppb
HC
HOURS
0
4
8
12
16
20
FREON-11
HC
OZONE
RADIATION

DATE 7-16-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100					5	0			
0200					4	0			
0300					6	0			
0400					5	0			
0500					6	0			
0600					7	0			
0700					6	0.16			
0800					10	0.42			
0900					60	0.68			
1000				72	63	0.90			
1100					70	1.08			
1200					79	1.20			
1300					78	1.24			
1400					76	1.20			
1500				71	94	1.06			
1600					124	0.90			
1700					130	0.66			
1800					121	0.44			
1900					88	0.20			
2000					77	0			
2100					60	0			
2200					60	0			
2300					64	0			
2400					60	0			

DATE 7-17-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100		50			55	0			
0200		60			43	0			
0300		67			30	0			
0400					23	0			
0500					17	0			
0600					13	0			
0700					20	0.16			
0800		108		87	38	0.40			
0900	144	75	146		55	0.66			
1000	145	76	147	108	61	0.88			
1100	135	68	144		68	1.06			
1200	134	62	142		70	1.20			
1300	122	60	143		70	1.26			
1400	126	50	135		60	0.36			
1500	131	58	140	67	61	1.20			
1600	124	60	146		72	0.94			
1700	–		–		100	0.24			
1800	156	88	129		95	0.06			
1900	144	74	135		62	0.28			
2000	145	75	135		51	0			
2100	149	75	135		46	0			
2200	158	77	135		42	0			
2300	156	91	134		33	0			
2400	152	199	135		24	0			

DATE 7-18-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	208	280	142		13	0			
0200	230	317	151		5	0			
0300	241	328	154		5	0			
0400	250	342	182		4	0			
0500	280	299	171		3	0			
0600	177	210	160		21	0			
0700	141	137	140		32	0.18			
0800	130	114	135	45	39	0.10			
0900	124	107	128		40	0.68			
1000	124	100	129	27	48	0.98			
1100	123	100	129		55	1.06			
1200	125	102	130		65	0.72			
1300	123	100	137		58	0.70			
1400	122	100	135		60	0.80			
1500	118	107	130		50	0.20			
1600	121	109	135		59	1.04			
1700	124	107	135		62	0.50			
1800	121	102	135		57	0.20			
1900	121	103	134		53	0.04			
2000	123	100	128		46	0			
2100	122	100	134		43	0			
2200	124	98	130		35	0			
2300	125	100	123		27	0			
2400	-	-	-		27	0			

DATE 7-19-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100					25	0			
0200					25	0			
0300					28	0			
0400					29	0			
0500					28	0			
0600					29	0.02			
0700					25	0.10			
0800	122	87	123	33	27	0.14			
0900	122	88	123		33	0.22			
1000	—	—	—	30	30	0.34			
1100	123	99	123		30	1.00			
1200	126	97	124		32	1.16			
1300	126	87	126		45	1.26			
1400	126	84	127	27	46	1.20			
1500	128	85	127		46	1.12			
1600	129	94	127		45	0.98			
1700	127	90	127		44	0.76			
1800	131	87	127		43	0.50			
1900	120	80	120		32	0.14			
2000	119	80	122		32	0.02			
2100	117	80	120		42	0			
2200	115	80	120		40	0			
2300	115	80	113		43	0			
2400	114	71	120		40	0			

DATE 7-20-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/mi
0100	115	74	115		37	0			
0200	115	71	118		27	0			
0300	116	74	119		18	0			
0400	115	71	117		18	0			
0500	117	71	120		16	0			
0600	116	72	118		16	0.02			
0700	118	71	120		20	0.06			
0800	117	69	120	38	17	0.14			
0900	118	77	122		19	0.26			
1000	119	72	120		30	0.90			
1100	118	72	120		48	1.22			
1200	124	69	122	47	51	1.36			
1300	116	71	120		52	1.36			
1400	121	69	122		52	1.30			
1500	129	72	124		62	1.12			
1600	126	74	125		61	0.96			
1700	129	72	121		61	0.70			
1800	126	77	123		57	0.44			
1900	121	71	122		55	0.20			
2000	122	77	122		41	0			
2100	124	75	122		31	0			
2200	129	77	120		28	0			
2300	128	72	122		27	0			
2400	125	79	124		23	0			

DATE 7-21-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	126	79	121		22	0			
0200	123	72	122		18	0			
0300	123	76	121		20	0			
0400	121	79	120		25	0			
0500	122	73	122		20	0			
0600	121	73	118		18	0.02			
0700	126	79	119		18	0.20			
0800	147	85	124	31	21	0.48			
0900	--	76	124		28	0.74			
1000	137	76	118		41	0.98			
1100	120	75	120		50	1.14			
1200	116	72	121		52	1.24			
1300	114	72	121		58	1.32			
1400	116	70	122		56	1.16			
1500	118	73	123		55	1.00			
1600	113	70	120		54	1.18			
1700	117	72	119		52	0.60			
1800	118	72	118		51	0.40			
1900	118	72	118		51	0.24			
2000	116	73	119		35	0.02			
2100	132	73	116		27	0			
2200	113	72	118		16	0			
2300	120	75	120		17	0			
2400	124	78	119		25	0			

DATE 7-22-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	125	89	121		20	0			
0200	125	94	119		12	0			
0300	133	92	123		21	0			
0400	141	96	124		10	0			
0500	141	93	121		12	0			
0600	147	90	120		9	0.02			
0700	140	87	119		10	0.18			
0800	135	87	124	50	13	0.42			
0900	129	84	125		45	0.68			
1000	128	99	126	38	55	0.88			
1100	127	93	120		70	1.20	5	183	
1200	127	95	122	31	70	1.20	5	210	
1300	124	99	123		71	1.42	5	124	
1400	124	89	123		68	0.90	8	75	
1500	124	87	124		70	1.20	8	102	
1600	127	87	126		67	1.00	8	129	
1700	123	78	124		77	0.76	8	129	
1800	122	79	126		62	0.56	8	129	
1900	124	81	124		62	0.30	5	124	
2000	124	79	121		54	0	5	75	
2100	146	81	119		46	0	5	75	
2200	148	87	123		44	0	5	102	
2300	143	96	121		50	0	5	102	
2400	138	92	121		51	0	5	102	

DATE 7-23-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100	142	97	122		45	0	5	119	
0200	151	120	125		45	0	7	119	
0300	157	127	126		45	0	7	129	
0400	161	115	128		43	0	7	124	
0500	168	102	129		35	0	7	146	
0600	178	114	130		25	0	7	156	
0700	180	129	135		21	0.02	10	167	
0800	166	125	136		25	0.12	10	194	
0900	159	117	136	66	25	0.24	10	159	
1000	139	95	138		47	0.60	5	156	
1100	136	91	127	46	42	0.92	7	129	
1200	138	93	123		32	1.18	10	129	
1300	138	117	137	59	60	1.22	10	156	
1400	147	102	133		90	0.70	10	139	
1500	148	118	135		57	1.14	15	167	
1600	141	114	130		47	0.40	15	183	
1700	132	87	129		47	0.74	13	188	
1800	131	85	127		40	0.80	13	183	
1900	119	73	119		33	0.04	8	188	
2000	119	68	118		42	0	8	270	
2100	112	67	116		45	0	10	210	
2200	118	68	118		31	0	5	324	
2300	112	65	116		29	0	10	210	
2400	112	67	118		30	0	10	227	

DATE 7-24-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100	111	65	118		27	0	12	227	
0200	111	68	119		30	0	12	227	
0300	112	68	121		31	0	10	227	
0400	112	68	121		26	0	4	243	
0500	112	65	121		25	0	4	270	
0600	111	68	122		21	0	4	270	
0700	113	68	118		21	0.16	4	270	
0800	114	65	121		24	0.38	4	270	
0900	120	74	123		34	0.68	5	308	
1000	120	70	125		41	1.00	10	313	
1100	115	70	125		45	1.00	7	308	
1200	126	68	125		43	1.20	8	308	
1300	122	81	126		45	1.00	10	340	
1400	120	70	131		47	1.32	10	351	
1500	122	78	125		45	0.40	5	351	
1600	124	75	128		49	0.60	7	351	
1700	128	78	125		45	0.50	7	16	
1800	119	91	123		40	0.20	5	27	
1900	118	73	122		40	0.10	5	16	
2000	116	84	118		40	0.02	5	16	
2100	117	84	119		38	0	5	43	
2200	119	85	119		20	0	1	77	
2300	120	80	118		25	0	1	243	
2400	120	84	122	76	28	0	1	324	

DATE 7 26 75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/ml
0100	130	85	127		31	0	4	119	
0200	138	95	130		30	0	3	119	
0300	135	93	122		27	0	3	119	
0400	132	90	131		20	0	0	47	
0500	132	90	133		12	0	3	46	
0600	131	91	132		15	0	1	75	
0700	130	87	127		15	0.14	1	129	
0800	129	83	121		21	0.38	3	102	
0900	126	78	121		38	0.66	5	156	
1000	123	83	136		50	0.96	5	156	
1100	126	80	167		54	0.94	5	183	
1200	124	80	123		60	1.30	5	183	
1300	124	80	126		68	1.30	5	210	
1400	123	78	123		75	1.30	5	156	
1500	124	78	133		73	0.90	5	243	
1600	125	77	126		73	0.60	5	210	
1700	129	73	128		69	0.72	5	183	
1800	127	81	129		66	0.60	5	187	
1900	150	84	128		62	0.24	5	156	
2000	153	70	127		56	0.04	3	129	
2100	161	98	139		56	0	3	113	
2200	166	111	144		53	0	3	113	
2300	166	135	142		50	0	3	113	
2400	184	149	177		61	0	5	167	

DATE 7-27-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100	247	201	137		45	0	7	183	
0200	237	193	136		43	0	7	194	
0300	226	172	135		40	0	3	183	
0400	205	154	132		30	0	2	75	
0500	159	110	125		43	0	2	183	
0600	140	100	125		41	0	3	243	
0700	129	91	121		35	0.12	3	270	
0800	132	88	122		35	0.34	3	270	
0900	126	84	121		32	0.62	5	270	
1000	119	74	123		40	0.84	8	243	
1100	119	73	121		45	1.02	7	243	
1200	119	81	122		48	1.16	7	270	
1300	116	75	122		51	1.20	7	270	
1400	117	75	122		55	1.26	5	243	
1500	118	77	124		57	1.10	6	210	
1600	118	78	127		60	0.90	6	210	
1700	118	73	127		57	0.68	6	221	
1800	119	74	127		50	0.44	4	221	
1900	121	74	124		39	0.20	5	173	
2000	121	75	124		40	0.02	4	173	
2100	118	75	124		45	0	10	227	
2200	123	73	123		47	0	6	227	
2300	117	68	123		45	0	2	324	
2400	116	68	124		44	0	0	75	

DATE 7-28-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	123	68	125		33	0	2	75	
0200	124	71	123		35	0	2	[illegible]	
0300	122	73	124		20	0	2	336	
0400	122	74	124		22	0	2	16	
0500	123	72	124		22	0	2	16	
0600	143	93	124		16	0	2	351	
0700	135	78	123		14	0.12	3	351	
0800	–	85	126		18	0.38	5	43	
0900	129	80	124		27	0.68	5	43	
1000	123	75	122		40	0.90	7	43	
1100	127	84	122		47	1.10	7	43	
1200	120	83	123		51	1.20	7	43	
1300	130	85	123		56	1.36	7	70	
1400	124	91	124		56	1.30	7	43	
1500	122	75	122		56	1.12	7	16	
1600	136	74	126		65	0.94	7	43	
1700	129	80	125		59	0.70	7	70	
1800	130	85	126		56	0.44	7	43	
1900	128	90	122		57	0.20	7	43	
2000	124	91	121		52	0	6	43	
2100	128	85	118		35	0	5	81	
2200	128	84	118		50	0	6	70	
2300	124	86	118		41	0	8	81	
2400	132	97	118		31	0	3	97	

DATE 7-29-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	139	115	117		34	0	2	97	
0200	136	100	117		20	0	2	97	
0300	142	115	118		13	0	1	43	
0400	147	118	118		15	0	1	54	
0500	191	118	120		16	0	3	0	
0600	210	110	118		15	0	1	5	
0700	209	125	122		7	0.12	1	156	
0800	192	123	125		27	0.36	3	129	
0900	180	125	125		40	0.62	5	129	
1000	-	-	-		45	0.86	5	129	
1100	-	-	-		55	1.00	7	129	
1200	-	-	-		57	1.24	8	129	
1300	131	95	131		80	1.20	10	129	
1400	133	102	131		95	1.16	10	129	
1500	136	105	144	40	77	1.06	10	129	
1600	136	94	136		69	0.80	10	129	
1700	137	90	134		70	0.64	10	129	
1800	134	92	120		78	0.38	7	129	
1900	132	97	138		72	0.24	3	129	
2000	140	97	135		70	0.02	3	102	
2100	133	94	133	69	52	0	5	102	
2200	139	97	132		45	0	5	113	
2300	129	99	132		41	0	5	113	
2400	133	98	136		39	0	3	86	

DATE 7-30-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100	134	91	138		35	0	3	102	
0200	140	93	139	66	35	0	3	113	
0300	142	93	140		35	0	3	92	
0400	139	93	136	76	35	0	0	65	
0500	137	88	136		25	0	2	27	
0600	133	88	135		21	0	2	16	
0700	134	93	136		15	0.10	0	70	
0800	143	91	138		16	0.30	3	97	
0900	–	–	–	110	28	0.56	5	129	
1000	–	–	–		49	0.80	5	113	
1100	141	127	135	84	52	1.00	5	102	
1200	141	118	135		60	1.10	5	129	
1300	131	98	131	62	57	1.16	7	129	
1400	131	97	130		50	1.10	10	102	
1500	131	97	131	65	55	1.10	10	102	
1600	126	90	129		55	0.32	10	102	
1700	127	95	138	67	52	0.26	5	102	
1800	134	98	129		51	0.28	7	75	
1900	134	98	131	49	50	0.10	5	129	
2000	133	102	127		39	0	5	86	
2100	138	101	129	54	42	0	7	86	
2200	144	111	133		44	0	7	86	
2300	147	138	136		45	0	7	86	
2400	189	183	140	50	47	0	7	86	

DATE 7-31-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	157	205	137		51	0	5	102	
0200	157	196	135	56	50	0	5	102	
0300	157	195	135		50	0	3	75	
0400	157	203	135	57	35	0	3	75	
0500	178	225	135		35	0	2	43	
0600	157	210	132	81	20	0	2	97	
0700	157	202	131		25	0.12	1	97	
0800	192	196	134	105	22	0.34	3	70	
0900	195	179	134		40	0.60	5	129	
1000	150	154	127	92	25	0.80	10	129	
1100	134	164	–		30	1.00	10	129	
1200	143	107	130	36	48	1.16	10	129	
1300	142	91	126		57	1.24	10	129	
1400	142	90	124	36	55	1.24	10	129	
1500	141	90	125		55	0.40	10	129	
1600	138	92	126	38	50	0.96	10	129	
1700	137	79	123		52	0.70	10	102	
1800	133	79	122		49	0.44	8	117	
1900	–	–	–	34	53	0.04	8	102	
2000	141	86	126		31	0	5	129	
2100	142	100	122	73	35	0	5	156	
2200	–	–	–		37	0	5	129	
2300	–	–	–	79	30	0	5	129	
2400	–	–	–		25	0	3	102	

DATE 8-1-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/ml
0100	121	79	123	52	20	0	3	75	
0200	129	86	127		19	0	5	102	
0300	131	88	130		17	0	3	86	
0400	133	82	127		10	0	3	75	
0500	132	84	127		12	0	3	75	
0600	131	86	127		10	0	3	75	
0700	123	86	128		13	0.12	3	102	
0800	137	79	129		22	0.40	5	102	
0900	117	79	133	50	30	0.64	10	113	
1000	118	79	121		35	0.56	15	113	
1100	116	84	122	52	40	1.10	15	113	
1200	115	73	122		35	1.30	15	113	
1300	116	73	122	43	40	0.80	17	102	
1400	115	77	123		35	0.40	17	102	
1500	115	77	123	34	32	0.26	12	113	
1600	121	77	121		25	0.14	7	113	
1700	121	82	123	40	20	0.04	5	113	
1800	122	81	123		23	0.10	7	113	
1900	120	79	129	29	22	0.04	7	129	
2000	119	73	131		19	0	7	129	
2100	119	79	131	31	16	0	7	113	
2200	121	79	134		18	0	7	129	
2300	125	81	157	31	14	0	5	113	
2400	117	62	210		17	0	5	129	

DATE 8-2-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	118	62	137		15	0	5	129	
0200	121	68	172	55	13	0	5	139	
0300	121	63	158		12	0	5	113	
0400	122	68	141	55	10	0	3	173	
0500	119	68	131		10	0	5	92	
0600	118	68	139	51	10	0	3	102	
0700	119	66	126		8	0	3	113	
0800	119	72	128	78	5	0	3	270	
0900	121	79	132		12	0.08	3	210	
1000	123	79	138	86	16	0.34	3	156	
1100	124	76	138		17	0.34	3	153	
1200	129	77	135	58	24	0.64	3	192	
1300	126	80	132		30	0.56	5	297	
1400	127	80	134		44	0.80	3	277	
1500	132	82	132	69	47	0.40	3	270	
1600	121	77	133		47	0.80	3	297	
1700	151	76	132	50	49	0.70	3	261	
1800	142	75	131		40	0.42	3	324	
1900	125	73	130	43	46	0.16	3	43	
2000	124	73	131		37	0	3	16	
2100	124	77	128	49	15	0	0	21	
2200	124	69	128		12	0	1	97	
2300	146	68	125	47	35	0	3	335	
2400	117	95	124		35	0	2	277	

DATE 8-3-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/mi
0100	130	97	125	35	20	0	3	247	
0200	119	97	127		22	0	1	270	
0300	130	99	127	35	16	0	3	324	
0400	150	107	125		16	0	3	324	
0500	128	109	123	41	15	0	3	324	
0600	117	--	--		10	0	3	324	
0700	120	113	122	51	15	0.04	5	351	
0800	124	109	126		22	0.22	5	351	
0900	122	109	124	61	25	0.70	5	351	
1000	120	101	124		34	1.00	7	43	
1100	119	97	124	46	48	1.08	7	43	
1200	119	119	126		48	1.20	7	43	
1300	120	101	126	42	52	1.40	7	43	
1400	131	105	125		54	1.26	7	16	
1500	123	105	128		58	1.22	7	43	
1600	131	107	125		58	1.00	7	16	
1700	122	111	128	48	55	0.70	7	16	
1800	124	107	127		55	0.30	7	16	
1900	126	113	126	57	52	0.20	5	0	
2000	126	107	123		44	0	5	0	
2100	126	111	125	47	40	0	5	97	
2200	126	107	122		25	0	1	97	
2300	128	111	122	67	12	0	1	97	
2400	132	106	122		5	0	1	70	

DATE 8 · 4 · 75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/ml
0100	132	107	122	54	7	0	1	97	
0200	132	107	123		5	0	1	97	
0300	122	103	123	58	6	0	1	97	
0400	132	103	124		16	0	1	107	
0500	131	103	123	73	3	0	1	32	
0600	–	–	–		7	0	1	286	
0700	135	107	124	53	3	0.10	1	97	
0800	128	99	126		11	0.38	1	243	
0900	126	91	121	54	23	0.60	2	210	
1000	159	95	122		42	0.90	3	297	
1100	121	91	122	56	60	1.08	5	43	
1200	137	97	131		55	1.20	5	43	
1300	124	97	135		63	1.26	5	16	
1400	127	95	133		64	1.22	5	129	
1500	125	103	125	57	60	1.12	5	251	
1600	134	119	125		58	0.93	5	43	
1700	123	91	123	97	58	0.70	5	351	
1800	126	97	124		59	0.40	7	70	
1900	126	91	123	56	53	0.18	5	70	
2000	122	97	120		36	0	1	129	
2100	124	97	120	66	39	0	3	75	
2200	122	97	118		25	0	3	102	
2300	131	95	121	58	27	0	0	97	
2400	124	95	124		18	0	2	97	

DATE 3-5-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100	124	95	125	69	10	0	6	113	
0200	126	97	124		18	0	2	247	
0300	126	97	126	47	11	0	0	270	
0400	130	93	127		13	0	3	102	
0500	128	97	127	53	12	0	1	97	
0600	-	-	122		7	0	2	210	
0700	170	95	124		10	0.04	2	270	
0800	125	99	122		15	0.09	2	270	
0900	125	97	122	63	20	0.24	1	270	
1000	124	101	122		40	0.88	3	270	
1100	122	98	123	47	58	0.60	7	297	
1200	124	95	122		59	1.10	7	297	
1300	121	97	126	46	65	1.32	5	243	
1400	125	97	128		64	1.20	5	251	
1500	121	105	122	40	64	1.12	5	270	
1600	127	109	126		68	0.88	5	270	
1700	126	109	124	47	45	0.26	10	27	
1800	126	115	123		42	0.26	7	16	
1900	125	115	123	38	43	0	4	70	
2000	134	117	122		34	0	4	102	
2100	138	121	122	50	30	0	4	0	
2200	134	121	124		20	0	2	129	
2300	130	137	122	51	19	0	1	324	
2400	140	157	128		9	0	3	324	

DATE 8-6-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/ml
0100	178	287	147	66	24	0	7	43	
0200	207	323	148		28	0	7	43	
0300	183	266	148	67	20	0	7	43	
0400	178	283	148		10	0	4	16	
0500	156	271	151	61	6	0	4	16	
0600	152	220	150		6	0	4	16	
0700	137	178	132	53	8	0.14	4	27	
0800	134	178	126		12	0.28	6	43	
0900	139	218	127		17	0.64	8	54	
1000	134	174	120		28	0.90	12	70	
1100	133	168	121	51	38	1.10	10	70	
1200	131	155	121		42	1.24	8	43	
1300	134	143	132	55	39	1.34	10	43	
1400	140	149	125		44	1.36	10	70	
1500	138	135	125	52	46	0.32	10	70	
1600	127	127	123		43	0.94	10	70	
1700	126	125	125	54	49	0.70	12	70	
1800	127	123	125		47	0.44	12	70	
1900	126	123	122	47	47	0.18	10	70	
2000	124	121	121		44	0	6	70	
2100	135	131	126	40	34	0	3	70	
2200	128	139	121		31	0	3	81	
2300	150	190	126	51	32	0	5	81	
2400	168	206	138		32	0	5	81	

DATE 8-7-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/ml
0100	156	229	138	56	25	0	10	96	
0200	151	226	137		28	0	5	107	
0300	145	218	138	61	28	0	5	97	
0400	146	210	140		24	0	3	107	
0500	143	214	140	77	20	0	3	97	
0600	143	210	144		14	0	0	43	
0700	159	228	147	90	12	0.14	1	351	
0800	153	212	141		20	0.40	3	70	
0900	151	198	134	102	25	0.66	7	183	
1000	140	180	131		42	0.90	5	102	
1100	136	164	128	46	54	1.10	5	129	
1200	135	153	129		59	1.20	5	97	
1300	128	129	128		61	1.28	7	102	
1400	127	121	130		67	1.22	7	129	
1500	129	123	129	40	67	1.10	7	102	
1600	134	121	121		64	0.94	10	102	
1700	133	127	132		62	0.70	10	102	
1800	135	127	132		60	0.44	10	102	
1900	139	129	130	37	60	0.20	8	102	
2000	141	131	129		57	0	5	81	
2100	136	133	128	64	51	0	5	92	
2200	134	135	125		46	0	5	119	
2300	132	137	127	48	42	0	4	102	
2400	138	137	128		34	0	5	113	

DATE 8-9-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/ml
0100	143	135	130	77	32	0	4	113	
0200	140	141	136		31	0	4	113	
0300	141	145	135	69	32	0	2	129	
0400	140	157	135		27	0	2	113	
0500	131	188	132	72	28	0	5	113	
0600	146	194	132		32	0	3	129	
0700	148	192	130	78	28	0.12	3	102	
0800	152	184	132		31	0.38	5	129	
0900	142	170	132	76	37	0.64	5	156	
1000	137	149	132		43	0.88	7	156	
1100	134	139	129	46	61	1.16	10	183	
1200	139	151	132		66	1.20	8	156	
1300	140	145	125	48	72	1.24	8	156	
1400	140	145	123		67	1.20	8	183	
1500	152	159	122	68	72	1.10	8	129	
1600	-	390	144		120	0.92	8	183	
1700	224	386	143	84	180	0.68	9	167	
1800	202	364	142		135	0.42	6	167	
1900	190	295	140	86	110	0.16	5	167	
2000	143	145	140		85	0	2	119	
2100	143	125	136	87	80	0	3	119	
2200	146	121	136		49	0	3	119	
2300	138	129	136	59	44	0	3	119	
2400	137	98	141		44	0	3	108	

DATE 8-9-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/ml
0100	143	101	146	67	27	0	3	113	
0200	149	121	141		38	0	3	129	
0300	175	171	143	112	27	0	2	129	
0400	177	189	143		20	0	3	129	
0500	210	218	146	130	15	0	3	75	
0600	212	221	144		12	0	3	102	
0700	204	234	146	151	16	0.10	2	102	
0800	186	186	139		21	0.24	1	75	
0900	149	121	131	62	45	0.62	3	183	
1000	146	117	129		51	0.82	3	243	
1100	133	95	126	45	62	1.04	3	270	
1200	130	90	126		66	1.15	3	243	
1300	128	92	127	30	65	1.22	3	156	
1400	134	95	130		67	1.20	5	210	
1500	136	96	131		69	1.00	5	156	
1600	127	97	131		63	0.66	5	183	
1700	129	102	136	34	67	0.76	7	156	
1800	144	111	135		70	0.16	7	183	
1900	151	118	135	45	85	0.20	5	183	
2000	173	134	142		90	0	5	183	
2100	–	–	–	92	92	0	3	156	
2200	–	–	–		72	0	5	183	
2300	177	180	142	96	55	0	4	156	
2400	185	139	142		44	0	5	156	

DATE 8-10-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100	208	155	140	85	22	0	5	167	
0200	202	147	138		25	0	5	183	
0300	169	118	136	76	32	0	8	194	
0400	155	111	139		36	0	7	194	
0500	150	107	141	56	29	0	7	194	
0600	147	104	146		40	0	7	194	
0700	171	122	138	69	19	0.04	3	156	
0800	153	100	141		13	0.30	2	173	
0900	140	102	142	55	36	0.58	5	210	
1000	141	102	140		44	0.76	8	210	
1100	140	99	138	48	53	0.98	8	183	
1200	140	99	139		52	1.12	8	183	
1300	140	96	137	37	52	1.10	10	183	
1400	141	104	139		55	1.20	12	183	
1500	150	105	135	55	58	1.16	12	183	
1600	155	108	139		72	0.88	8	210	
1700	153	107	138	52	87	0.66	8	210	
1800	160	104	139		95	0.36	5	193	
1900	158	102	144	65	92	0.12	5	156	
2000	158	101	138		80	0	5	156	
2100	154	99	138	67	68	0	7	140	
2200	151	95	138		50	0	5	183	
2300	144	95	138	51	47	0	5	183	
2400	136	113	133		40	0	5	183	

DATE 5-11-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	µg/m³	ppb	Ly	mph	deg	/ml
0100	137	113	133	72	34	0	8	210	
0200	133	106	130		40	0	10	210	
0300	134	110	137	66	30	0	2	75	
0400	133	108	137		33	0	2	156	
0500	131	103	137	49	31	0	3	75	
0600	130	101	137		28	0	3	102	
0700	126	101	138	59	27	0.08	7	92	
0800	128	103	138		31	0.32	5	243	
0900	129	101	139	60	39	0.58	7	227	
1000	128	103	136		45	0.42	7	243	
1100	130	106	138	65	52	1.00	7	243	
1200	131	108	138		54	1.00	7	200	
1300	133	103	134	61	60	1.00	8	227	
1400	136	106	136		60	0.84	5	227	
1500	132	103	126	68	56	0.38	8	351	
1600	130	99	133		-	-	8	135	
1700	132	103	128	71	58	0.20	8	135	
1800	133	106	139		63	0.40	8	183	
1900	138	110	138	79	63	0.14	4	199	
2000	138	108	138		64	0	1	102	
2100	137	108	138	83	40	0	2	65	
2200	157	115	170		36	0	1	75	
2300	155	142	144	44	46	0	1	76	
2400	172	173	147		23	0	2	129	

DATE 9-12-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.O.H
	ppt	ppt	ppt	$\mu g/m^3$	ppb	Ly	mph	deg	/mi
0100	160	157	142	100	25	0	6	183	
0200	137	120	140		31	0	8	205	
0300	136	122	141	42	22	0	8	221	
0400	134	122	140		27	0	10	227	
0500	134	124	138	97	38	0	10	221	
0600	122	134	140		43	0	7	243	
0700	130	120	136	77	62	0.12	5	248	
0800	131	127	132		52	0.14	4	235	
0900	133	124	137	96	59	0.58	5	242	
1000	132	118	136		73	0.96	6	261	
1100	133	120	143	79	88	1.10	6	259	
1200	131	106	142		86	1.14	6	254	
1300	133	114	145		90	1.18	6	248	
1400	134	114	145		85	1.00	6	221	
1500	134	118	142	74	85	1.20	6	243	
1600	134	—	135		75	0.80	9	183	
1700	136	114	146	95	74	0.56	9	183	
1800	138	120	144		72	0.44	9	188	
1900	144	147	149	90	83	0.14	6	156	
2000	157	169	154		100+	0	6	156	
2100	165	181	142	105	76	0	9	167	
2200	169	187	142		56	0	9	167	
2300	195	205	144	130	40	0	9	183	
2400	143	134	136		40	0	9	183	

DATE 9-13-75

TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	Ly	mph	deg	/ml
0100	128	124	129	98	44	0	10	210	
0200	130	114	135		47	0	12	210	
0300	131	114	138	90	50	0	10	210	
0400	130	116	136		61	0	10	210	
0500	131	116	136	64	55	0	10	210	
0600	128	130	138		66	0	10	210	
0700	131	130	133	67	58	0	7	210	
0800	133	122	137		59	0.06	6	225	
0900	132	114	134	86	45	0.36	5	225	
1000	134	108	129		32	0.10	5	251	
1100	129	106	131	98	31	0.10	3	146	
1200	132	112	131		31	0.16	5	183	
1300	127	108	130	83	28	0.36	3	270	
1400	123	104	129		43	0.28	5	183	
1500	121	98	127	55	47	0.56	5	243	
1600	125	100	127		48	0.32	5	270	
1700	124	100	127	59	58	0.40	5	270	
1800	123	104	127		55	0.30	5	243	
1900	123	102	128	58	47	0.04	7	210	
2000	122	104	127		25	0	3	183	
2100	120	98	126	55	35	0	1	129	
2200	123	100	127		30	0	1	129	
2300	118	98	128		20	0	1	129	
2400	119	100	127		16	0	1	270	

DATE 8-14-75

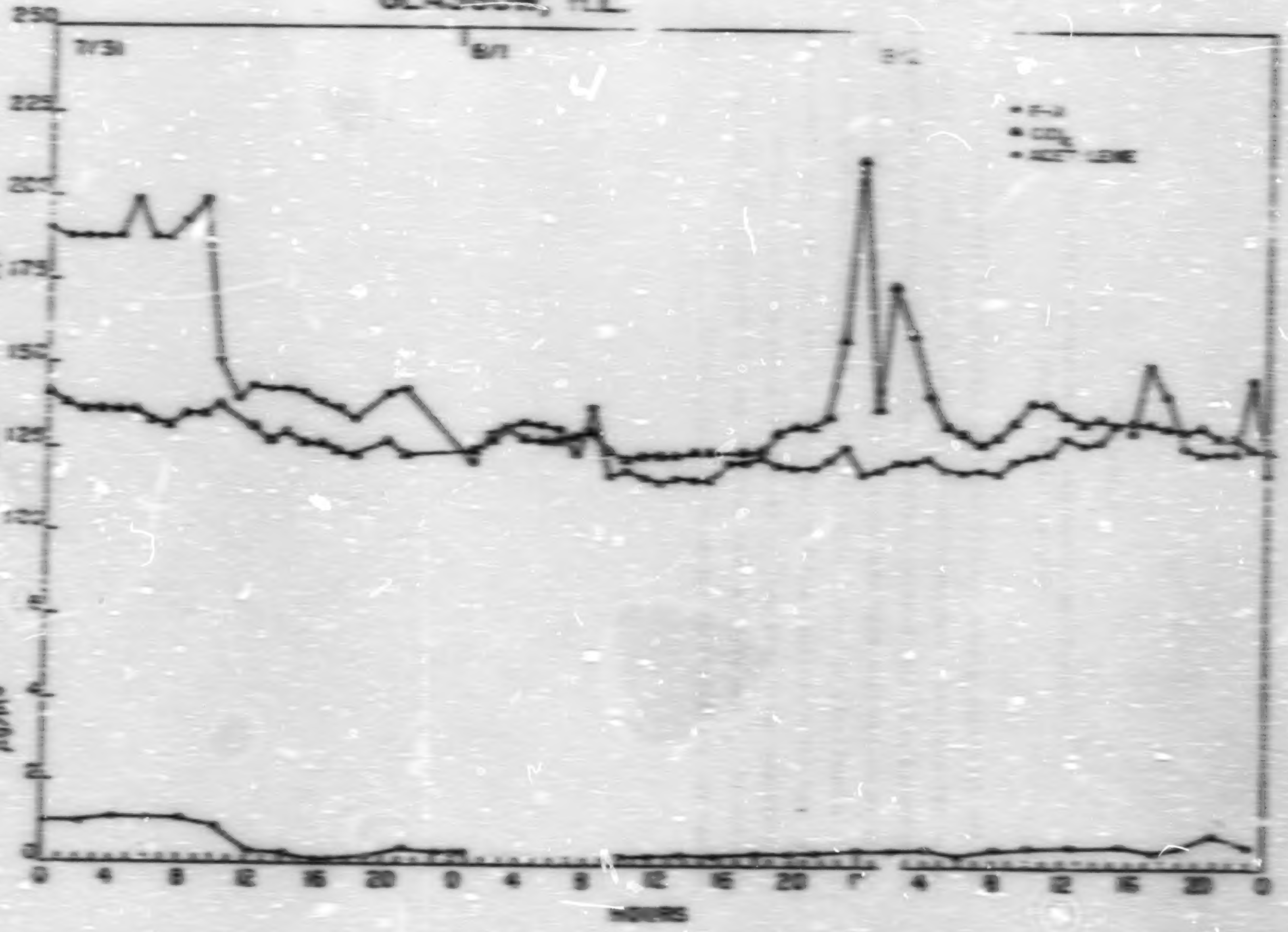
TIME	CCl_3F	CH_3CCl_3	CCl_4	NMTHC	O_3	RAD	W/S	W/D	C.C.N
	ppt	ppt	ppt	μg/m³	ppb	ly	mph	deg	/ml
0100	122	100	130	66	4	0	1	351	
0200	118	100	127		5	0.1	1	97	
0300	122	104	130	62	3	0	1	97	
0400	125	102	129		4	0	1	102	
0500	124	104	129	62	2	0	3	48	
0600	126	106	130		7	0	6	324	
0700	128	98	128	59	10	0	3	102	
0800							6	78	
0900							6	102	
1000							8	102	
1100									
1200									
1300									
1400									
1500									
1600									
1700									
1800									
1900									
2000									
2100									
2200									
2300									
2400									

Appendix C

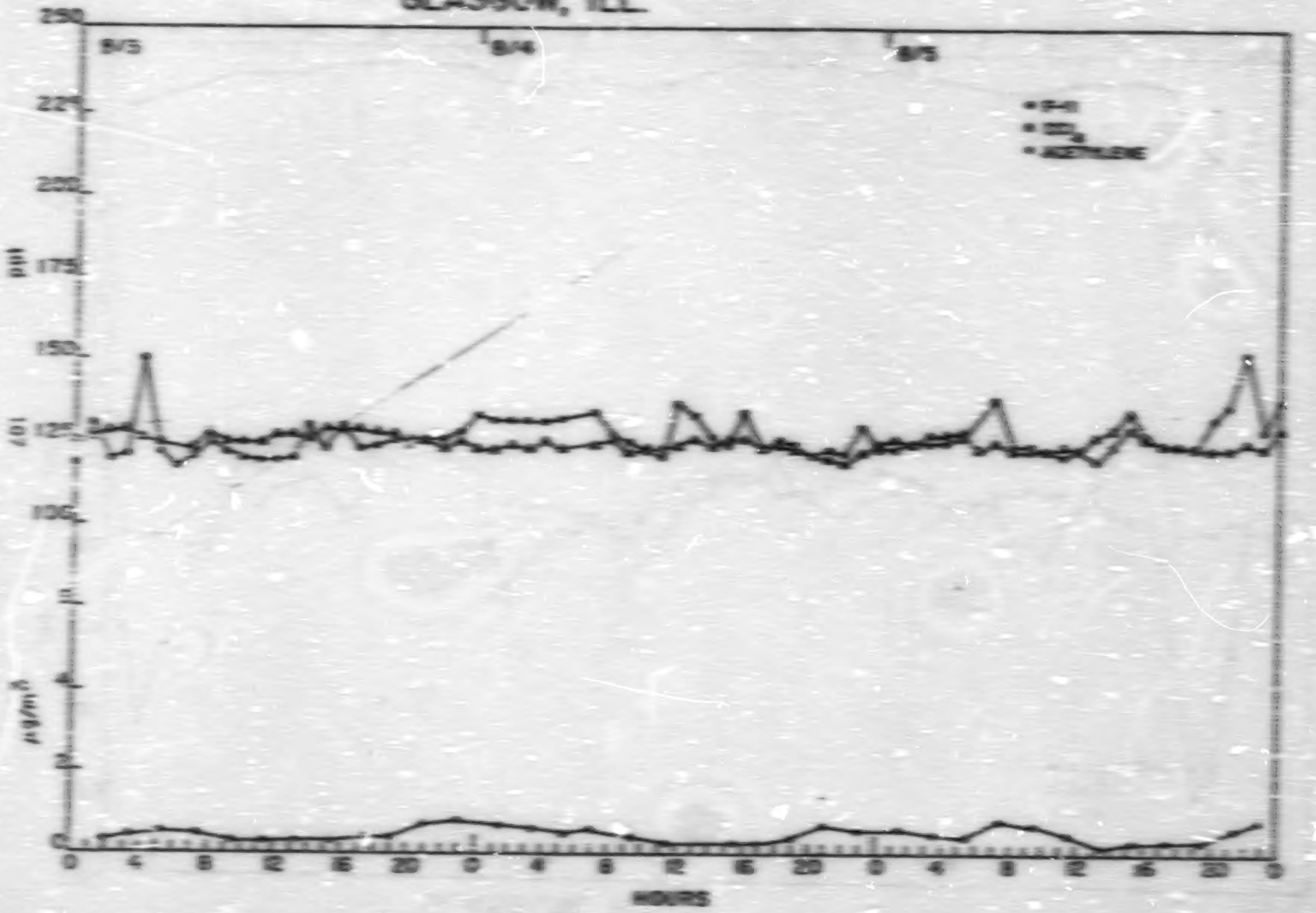
Urban-tracer Compounds -- Time-series Plots for Glasgow, Illinois Sampling

The following graphs compare the time histories of fluorocarbon-11, carbon tetrachloride, and acetylene at Glasgow, Illinois. The halocarbon measurements were made hourly; acetylene measurements were made less frequently, namely in conjunction with the other hydrocarbon measurements. Despite the lesser sensitivity and reproducibility of the flame-ionization detector technique used for acetylene, and its low rural values, we find that fluorocarbon-11 and acetylene agree very well as tracers of urban activity. Carbon tetrachloride (CCl_4) has sources that are less easy to describe, and this may account for the different nature of the CCl_4 trace.

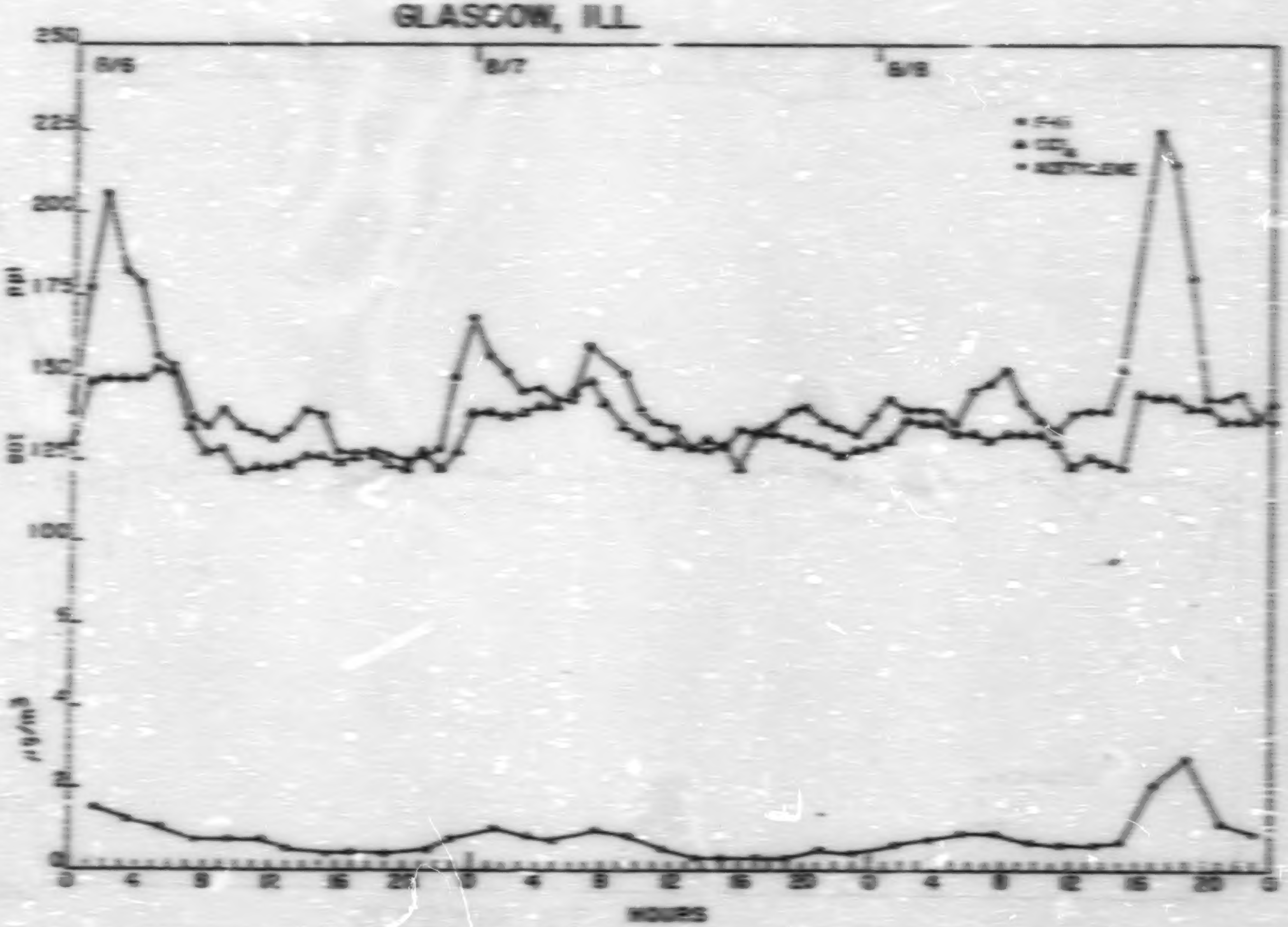
GLASGOW, ILL.

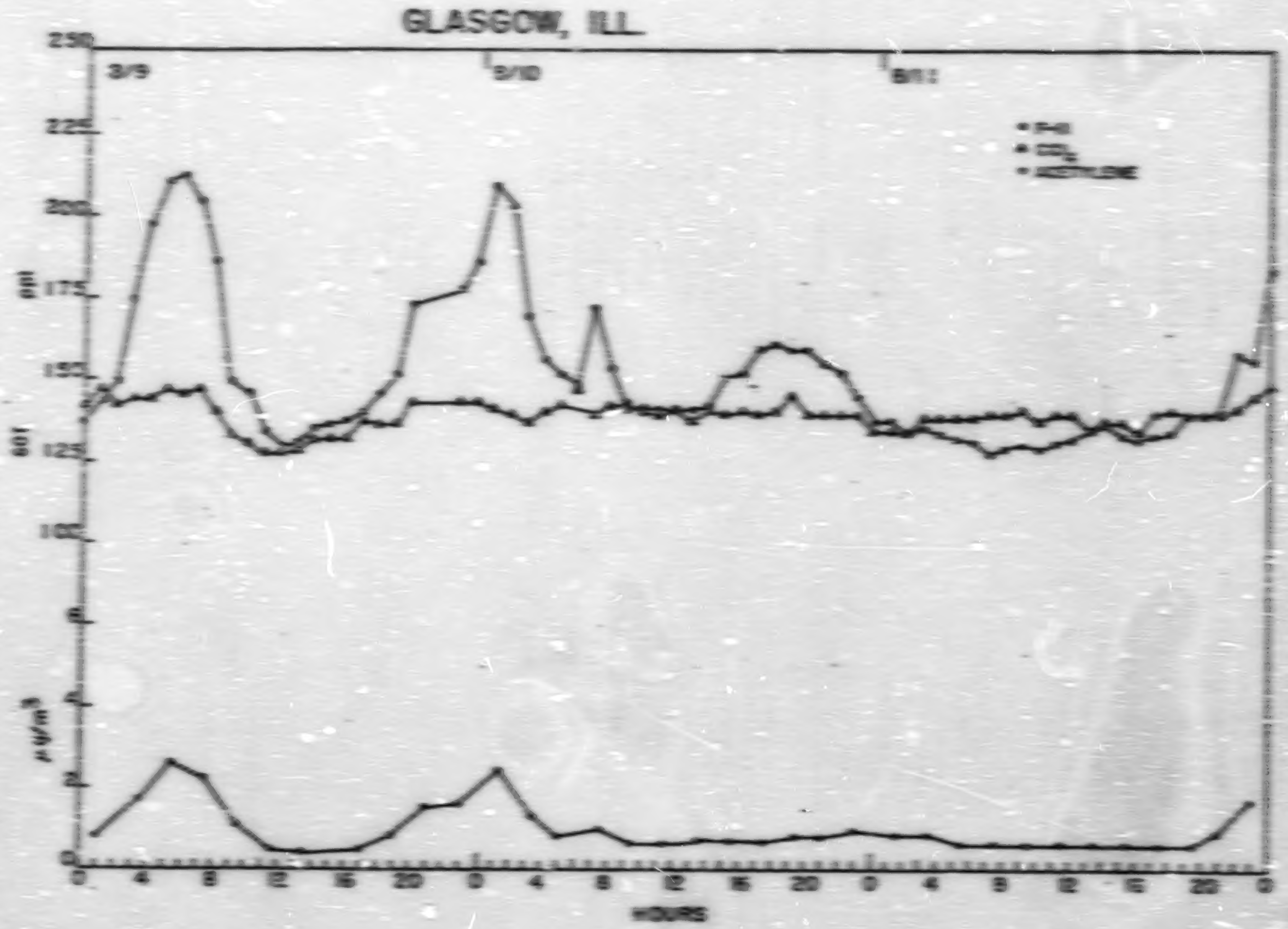

250
225
200
175
150
125
100
ppt
10
8
6
4
2
0
μg/m³
7/31
8/1
8/2
F-11
CCl4
ACETYLENE
0
4
8
12
16
20
HOURS

GLASGOW, ILL.



9/3
9/4
9/5
F-11
CCl4
ACETYLENE
ppt
250
225
200
175
150
125
100
6
4
2
0
µg/m³
0
4
8
12
16
20
0
4
8
12
16
20
0
4
8
12
16
20
0
HOURS


GLASGOW, ILL.
F-11
CCl_4
ACETYLENE
ppt
ppt
μg/m³
250
225
200
175
150
125
100
6
4
2
0
8/6
8/7
8/8
0
4
8
12
16
20
0
4
8
12
16
20
0
4
8
12
16
20
0
HOURS

GLASGOW, ILL.
3/9
3/10
3/11
F-11
CCl4
ACETYLENE
250
225
200
175
150
125
100
6
4
2
0
ppt
ppt
µg/m³
0
4
8
12
16
20
0
4
8
12
16
20
0
4
8
12
16
20
0
HOURS